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No. 1.

FARMING IN THE AUCKLAND PROVINCE.

OBSERVATIONS ON FARM-MANAGEMENT METHODS.

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(Continued.)

RODNEY COUNTY.

June 11th, 1934: Makarau to Wellsford.—Mostly sandstone hill country and large farms: hills have been grassed after surface-sowing, and there is a good deal of reversion to bracken fern and manuka. There has been some summer burning of danthonia on the hills, and the burnt areas are now a bright green and make a striking contrast with the unburnt areas of dry tufty danthonia. The rank summer growth must be taken off danthonia pastures each autumn if a reasonable pasture production is to be obtained—leaving the rank growth on will eventually thin out the danthonia plants. Two courses are open—one to burn, and the other to clean up the rank growth with young hungry cattle. Burning is the easiest, but it quickly converts the pastures into pure danthonia swards. If rye, cocksfoot, dogstail, and clovers are to be kept in the pastures, the fire-stick must give place to cleaning up with young and hungry cattle. Early maturity of run cattle on a great deal of hill country is impossible, as the cattle are the scavengers that clean up rank danthonia and crush out bracken fern. It is only young and hungry cattle that will do this work. Herefords and Shorthorns are the common beef cattle in the North, but one sees many Jersey-cross steers on the smaller grazing-runs, although this class of cattle hardly can be very profitable.

At Wellsford there are three lime-works busy crushing agricultural lime; it is a soft rock containing from 70 per cent. to 80 per cent. calcium carbonate which can be easily ground to a fine powder. Since basic slag became dear, lime is being used increasingly in North Auckland, and superphosphate and lime is now the common top-dressing mixture. Most of the clay soils respond to lime and superphosphate, and some give quite a good response to lime alone.

Just past Wellsford the gum land starts again. The misty rain, which had been falling since early morning, had now cleared up, and the country was enjoying a spell of warm sunshine. A mob of Jersey-cross calves running on the unimproved gum land covered in manuka and danthonia had come out of the scrub to an open patch of danthonia

to enjoy the warmth of the sun. They were a poor mob of calves, evidently turned out in the scrub to die or survive as best they could. With the dry danthonia and the shelter of the manuka the stronger ones will come through satisfactorily, but most of the weaker ones, already showing an unhappy condition of stomach-worm infection, probably will die. Wet heavy land with swampy patches—and this land is common throughout the North—makes it often difficult to rear good calves unless they are regularly dosed for stomach-worms right from the time they are on the bucket. It is still somewhat common to turn them out on the dry danthonia hills, but adequate supplementary hay feeding is also necessary if the calves are to come through the winter in good condition.

OTAMATEA COUNTY.

March 6th, 1934: Mangawai to Tokatoka.—Mangawai is a small village situated on a tidal-river harbour on the east coast. I was first here about twelve years ago, when Mangawai was a fairly busy place and all the flats round the village were being dug over for kauri-gum. Small gum was extracted from the soil and plant debris by washing. Deep parallel trenches were dug a few yards apart and the spoil from these trenches was thrown out on the intervening land; the soil was then passed through long rotating riddles and washed with water pumped out of the trenches. The water carried off the soil and left the gum and plant debris. All this gum digging and washing work is now finished, and only here and there can be seen the marks of the old workings.

Otamatea County stretches right across the northern peninsula from Mangawai on the east coast to the eastern shore of the Kaipara Harbour. The land surface of the country consists of rolling hills of claystone, sandstone, and limestone, with isolated areas of volcanic soil. In journeying across the country one is struck by the sparseness of settlement, the large size of holdings, and the large areas of vacant unimproved scrub land. There is much gum land lying in an undeveloped state, although on these gum lands there has been considerable development since I was first through the country. From Mangawai to Kaiwaka there were several areas of ploughed and fallowed land which were just ready for grass-sowing, and to which lorries were delivering crushed limestone from Wellsford. Two things have hindered development—lack of permanent water on a great deal of the country and road-transport conditions. The solution of the first difficulty will come in time, but the primary necessity for close settlement is an adequate supply of good water. The water-dams made in the valleys which are seen here and there over the country cannot be considered really good sources of water. Too often they become breeding-grounds for internal parasites in stock, and to be safe as supplies of water for farm purposes the catchment areas should be fenced from live-stock. Transport difficulties are now practically at an end, for there has been a wonderful improvement in the roads during recent years. For instance, the now well-metalled road from Kaiwaka to Mangawai was twelve years ago a poor rutted clay road, only negotiated with great difficulty by the old coach which plied between the two places.

The limestone soils are generally good, and the presence of ratstail grass on the roadside is a fairly sure indication of soils overlying limestone. Ratstail will not tolerate very cold conditions, and its climatic

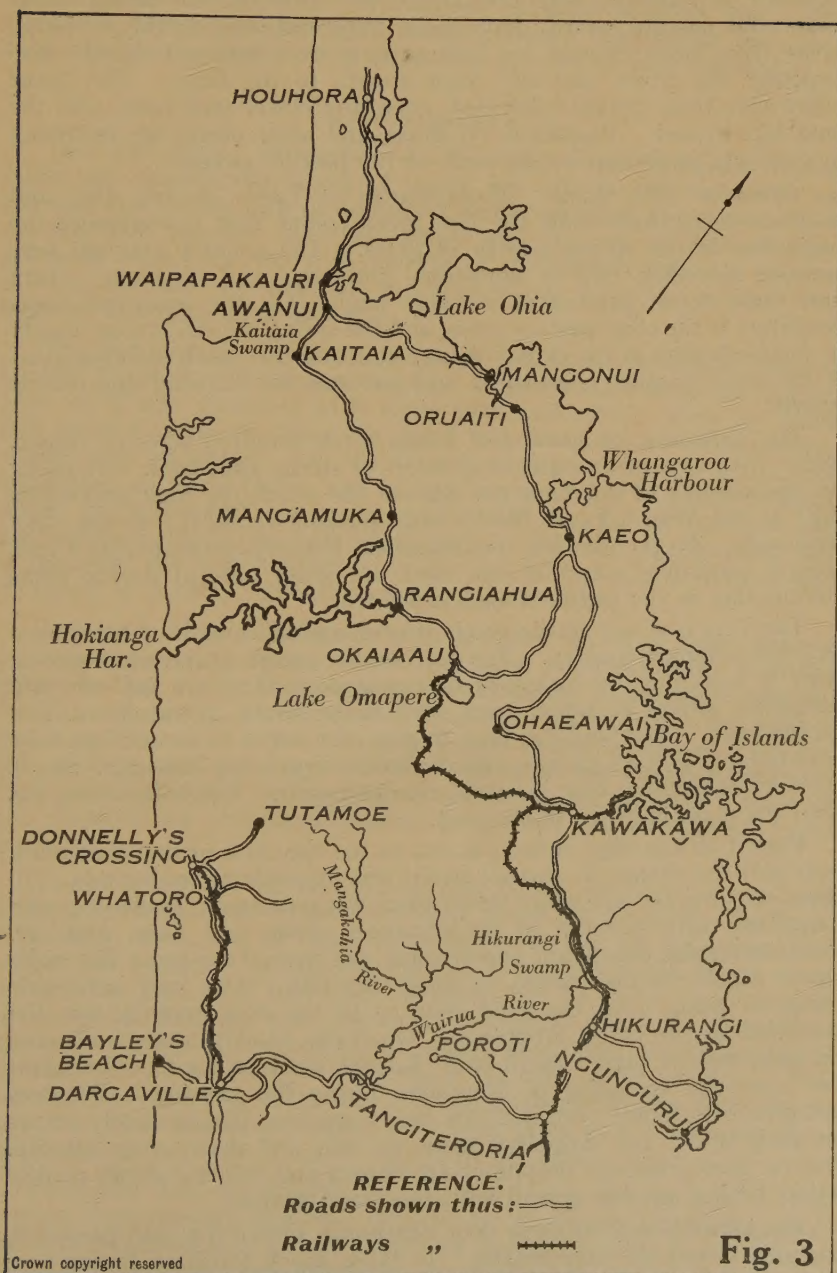


FIG. 3. JOURNEY IN WHANGAREI, HOBSON, BAY OF ISLANDS, HOKIANGA, WHANGAROA, AND MANGONUI COUNTIES.

range is somewhat similar to *paspalum*. At one time most of the pastures on limestone soils about here were ratstail, but during recent years the pasture swards have been improved considerably. Large areas have been cleared by late autumn and winter burning, thus exposing the crown and any fresh growth to the frost. The burnt areas were then surface-cultivated, grass and clover seed sown, and the land top-dressed. *Paspalum*, rye-grass, and white clover are becoming increasingly important constituents of the pasture swards.

September 18th, 1934: Maungaturoto to Tara.—A fine day, and pastures everywhere show the rich green colour that accompanies the beginning of the spring growth of grass. The country through here consists of rolling hills of sandstone, limestone, and claystone: here and there occur patches of volcanic land. On the limestone areas *paspalum* is the chief pasture grass, and the spring growth is seen mainly in the freshening of the clover plants, whilst on the basalt soils rye-grass is the main pasture constituent and pastures are showing appreciable growth.

The Tara is a low mound of basalt a few hundred acres in extent, which rises as a green oasis in a desert of sterile gum land. Standing on the summit of the Tara one sees to the north the high greywacke hills of the Waipu Fault Block, with Maranui (1,114 ft.) as the chief landmark. To the east lies the Mangawai Estuary, protected by a long coastal sand-dune; and to the west are steep hills of dacitic rocks culminating in the Cattle Mound (1,600 ft.).

The Tara is a very fertile patch of land, and has long been recognized as great fattening country. The pastures are rye-grass and white clover, with a leavening of cocksfoot and *paspalum*, and are set off with numerous groves of puriri trees with some totara, pohutukawa, and tarairi trees. The land has been in grass for many years and has been maintaining a good pasture sward without much top-dressing: this is the sort of country that does not change hands. Cattle-fattening has been the main industry in the past.

Passed off the edge of the Tara on to the clay hills of the Waitemata beds and the change in pasture sward was immediately noticeable. In place of rye-grass and white clover there was *danthonia*, brown-top, and *paspalum*, with patches of subterranean clover and *Lotus hispidus*. Without regular phosphatic top-dressing, pastures of rye-grass and white clover cannot be maintained on these clay hills. One very noticeable thing on going from the good country to the poor country was the condition of the cattle droppings. On really good pasture land—and by good pasture land I mean land that will produce 200 lb. of butterfat per acre—the spreading of droppings during the growing-season does not give any trouble even with the heavy stocking that naturally occurs on such land: the droppings seem to melt and decay very rapidly. But on poor grassland droppings are fibrous and will not decay readily unless broken up and spread with the grass harrows.

The improvement of these poor *danthonia*, brown-top, and *paspalum* pastures is not an easy matter. It takes much fertilizer to improve them, and even when manured the production is not as high as it would be if the pastures were renewed and sown down with good rye-grass and white clover. The pastures examined had a fair sprinkling of subterranean clover through them, and improvement, without

renewing, should aim at working the pastures into paspalum and subterranean clover. This combination is quite a good one: subterranean clover produces good autumn, winter, and spring feed, and thus fills up the period when paspalum is more or less dormant.

HOBSON COUNTY.

June 13th, 1934: Dargaville.—In the valley of the Northern Wairoa River are considerable areas of heavy flat alluvial, above which on the east rise rolling hills of claystone, sandstone, and limestone, whilst on the west between the river valley and the sea lie hills of consolidated sand. On the river margin of the eastern hills are patches of volcanic rock—for example, the remarkably sharp and symmetrical cone of Totatoka Peak (660 ft.).

The flat alluvial clay land, generally similar to the heavy alluvial land at Parakai in Waitemata County, is somewhat difficult to handle. Most of it was timbered with white pine and rimu: after the mills had worked over the bush, the land was drained and surface-sown, chiefly with paspalum. On the timbered country cleaning up is now completed on many farms, and pasture improvement has been brought about gradually with the surface-cultivation of existing pastures and the sowing of rye-grass and white clover. Without tile-draining this is probably the best method on really wet land, for if undrained and ploughed it is often difficult to get a good seed-bed.

The sandy hills between the river and the sea show three distinct formations—moving dunes, which are being stabilized with marram-grass planting, young Pleistocene sands which may be developed usefully for farming, and on the east older Pleistocene sands where the surface has been leached and the iron podsol type of soil developed. On the iron podsoles hard pans occur through the sand and prevent drainage. This makes the hills wet in winter and dry in the summer. Most of the pastures on this land consist of stunted paspalum and *Lotus hispidus*.

Visited a farm on the flat alluvial clay land. The farm is 120 acres in area, of which some 15 acres are light sandy hill country. The farm milks fifty cows, and the total butterfat-production for the season just ended was 13,000 lb. of fat, the bulk of which was taken off 75 acres of rich flat land that had been ploughed out of the original swamp surface-sown pasture, and resown to perennial rye-grass, paspalum, and white clover. It is not a particularly good farm, for better farms on this heavy land are producing 150 lb. or over of fat per acre. The current low price for butterfat is making dairy-farming difficult on any land that has been bought at a high price and where butterfat-production is below from 140 lb. to 150 lb. per acre.

Paspalum does remarkably well on this heavy alluvial land. It is a grass that requires high soil fertility for maximum production, and on wet undrained land it will withstand flooding conditions for several weeks at a time, and has proved an excellent pioneer in the bringing in of this heavy alluvial land. When the land is drained it combines well with rye-grass and white clover, provided paspalum growth is not allowed to become too rank in the summer. Management then

has a great deal to do with pasture maintenance: the surplus summer growth of *paspalum* should be cut and saved as hay and silage if rye-grass and white clover are to be maintained in the pasture sward.

Leaving the flat alluvial land, I travelled westwards to Bayly's Beach on the coast. On the westerly hills the iron podsol soils give place to reddish sandy loams which will carry quite fair grass. Most of the original grassing of this country was done by burning the scrub and surface-sowing *danthonia*, ratstail, and *paspalum*. Some recent development work has been done here in grassing a block of land for small-farm-plan settlement. Quite good pastures of rye-grass, *paspalum*, and white clover have been established.

The land dries out rather badly in the summer, but the winter growth is good: where *paspalum* forms an important part of the sward summer pasture-growth is quite fair. Ploughed, grassed, and top-dressed, much of this scrub land should be very suitable for fat-lamb raising. Without supplies of good certified perennial rye-grass seed the grassing of this country with high-class pastures would have been impossible. The country is watered by lakes which occur in the valleys of streams which have been blocked by drifting sand. I saw some excellent crops of Superlative swedes on this land: they had been sown with a superphosphate-lime mixture, and there is no doubt that on practically all soils this mixture is an excellent fertilizer for both swedes and soft turnips: it gives a good strike, which is one of the main requirements of a good turnip crop.

September 20th, 1934: Dargaville to Donnelly's Crossing.—The Kaihu River Valley, famed for its kauri trees, extends north-west from Dargaville and runs parallel to the west coast: in the south, between the river valley and the sea, lie hills of consolidated sand with swamps in the valleys, but north of Maropiu these hills give place to hills of basalt on which are light dry reddish soils. The river valley is narrow, but contains some excellent flat land that is, however, liable to be flooded in times of heavy rainfall: on these flats *paspalum* pastures predominate. To the east of the valley are low scrub-covered hills—either consolidated sand or claystone—behind which rise high dolerite hill masses (Angiangi, 1,420 ft.) which are still partially forest-clad.

The soil on the basalt coastal hills is very dry and most of the pastures consist of *danthonia*, brown-top, and stunted *paspalum*. White clover does not do particularly well—it may be due to the dryness of the soil, and possibly to the need of lime and phosphates. Visited a farm at Aranga on the basic volcanic land where the pastures were much better than the average of the district—they contained quite a fair amount of rye-grass and white clover. Some newly sown pastures were poor in white clover, but this may have been due to poor consolidation of seed-bed, for no roller was used at sowing-time. The farmer was ploughing old grassland for a crop of soft turnips and swedes: two things would have improved the preparation of the seed-bed—*i.e.*, the use of a skim coulter on the plough and rolling the land on the furrow before disking. A clean seed-bed is essential for a good crop of swedes, and even a small amount of grass growing between the furrow slices reduces the yield. A skim coulter on the plough does not appreciably increase

the draught and makes an excellent job in getting a good clean seed-bed for roots after grass. This light land would also benefit in consolidation from a rolling of the furrow.

Travelled on past Kaihu to the high volcanic country of Whatoro and Tutamoe. This tableland is very wet, and the past development of the bush sections has not been very successful. The land was originally very thickly timbered, and owing to the high rainfall the burns did not clear up the small timber. Most of the pasture land consists of a tight sward of broad-leaved plantain and moss. There is a camp of unemployed men here engaged in logging up the timber on old burns, but it looks as if the patches will have to be completely cleared and ploughed before better pastures can be established.

June 14th, 1934: Dargaville to Tangiteroria.—The road follows the valley of the Northern Wairoa River or crosses low sandstone hills to give a more direct route across the windings of the river. The Wairua Stream, which in the lower part of its course becomes the Wairoa River, has its sources in a central, roughly rectangular basin, the eastern side of which is in places within two or three miles of the east coast. The Hikurangi Swamp lies near the middle of this basin and receives the run-off from the surrounding country by way of streams which flow into it from all points of the compass except the south-west. From the Hikurangi Swamp the Wairoa River flows in a deep sluggish stream in a narrow valley, then becoming shallower races over basalt to the Murimanui Waterfall: between this waterfall and the Wairua Falls it receives an important tributary from the east—the Mangere Stream. After joining the Mangakahia River from the north, the Wairoa River flows west through the gap between the Maungaru and Tangihua Ranges—steep volcanic mountains with bush-covered tops and surface-sown pastures on the lower slopes.

The hilly sandstone country, originally bush-clad, has been surface-sown and is used for sheep and cattle grazing. Pastures are danthonia on the poorest and driest soils, then, as fertility improves, brown-top, then paspalum, and finally on the best land paspalum, rye-grass, and white clover.

Top-dressing has started again on this hill country, and there were some stacks of sacks of superphosphate just delivered by the roadside gates. The top-dressing of hill country requires very careful planning. It should start with the best pastures and be gradually extended to the poorer ones. Increased production from the best pastures means a great deal more than increased production from the poorer pastures—for normally regular top-dressing doubles pasture-production. Top-dressing must be accompanied by increased stocking if the practice is to be payable, and this necessitates that the work must be spread over a number of years.

(To be continued.)

The Fields Instructor, Masterton, advises that pastures systematically top-dressed have provided feed during dry weather better than those untreated.

POTATO-GROWING IN NEW ZEALAND.

II.—DESCRIPTION OF VARIETIES.

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(Continued.)

AUCKLANDER TALL TOP.

Origin.—Selected from a crop of Sutton's Supreme by Mr. A. J. Rich and Mr. Laws, of Kaiapoi, in 1913.

Foliage.—Haulm vigorous, tall, and open; moderately erect and stiff. Stem, colour 2. Wings slightly waved. Leaf medium dull green; leaflets small and crinkled.

Flower.—White and fairly numerous; tall and prominent.

Tubers.—Oval to kidney. Skin creamy white, clear, and smooth; very thin and easily bruised. Flesh white. Eyes medium to shallow. Sprouts pale pink. Large tubers often mis-shaped.

Maturity.—Late main crop.

Notes.—One of the heaviest cropping varieties, and should be grown where yield alone is the main objective. It is going out of favour on account of its extreme lateness, which results in the skin being immature when dug, and, as a result, bruising exceptionally easily. Certified stocks are available.

The Tall Top may be distinguished from the Short Top by the following characteristics: The Tall Top is taller, the inflorescence is much more prominent, and the flowers more profuse. The Tall Top tubers are not so shapely, and they adhere to the parent plant when the whole shaw is pulled up just before maturity, and when removed tear away, leaving a much larger wound at the point where the stem is attached. When mature the Short Top haulms lie flat and devoid of leaves; in the Tall Top they stand semi-erect and often have attached a number of dead leaves. The Tall Top is about three weeks later than the Short Top, while Sutton's Supreme is distinctly earlier than either of the Aucklanders. Both varieties are often grown under the name of New Zealand Sutton's Supreme.

BEAUTY OF HEBRON (PINK).

Origin.—Raised in America from a seedling of Garnet Chili in 1878, and introduced into commerce by Peter Henderson, of New York.

Foliage.—Haulm medium height and vigour, moderately dense and spreading. Stem, colour 1. Wings moderately straight. Leaf medium to dark green; leaflets fairly large.

Flower.—White and numerous; tall and prominent; no colour in flower-stalk.

Tubers.—Long, spindle-shaped; often flattened and notched at heel end. Skin pink and moderately smooth. The skin around the eyes of a freshly dug tuber is creamy-white. Eyes moderately deep and evenly distributed. Flesh white. Sprouts pink.

Maturity.—Second early.

Notes.—Very difficult to distinguish from Early Rose. Of importance only as an impurity of Dakota, from which it can be distinguished by its more prominent inflorescence and the green flower-stalks. Very susceptible to late blight. No pure stocks are available.

BEAUTY OF HEBRON (WHITE).

Origin.—This variety is distinct from the true American White Beauty of Hebron, and probably is identical with White Elephant or Late Beauty of Hebron, in which case it originated as a cross between Garnet Chili and White Peachblow, and was introduced into commerce in America in 1881. See New Zealand White Elephant.

Foliage.—Haulm vigorous, tall, and open. Stem, colour 1; branching. Wings waved. Leaf medium to pale green; leaflets small.

Flower.—White; not very numerous; moderately tall.

Tubers.—Long, spindle-shaped; variable; usually pointed at both ends. Skin creamy white, splashed with variable amount of pink colouring which avoids the eyes. Skin smooth. Eyes medium deep. Flesh white and crisp. Sprouts pink.

Maturity.—Early main crop.

Notes.—A satisfactory garden variety, but too brittle for market. Wildings occur. Great variation in tuber colour, which ranges from almost pure creamy-white to almost all pink.

BLACK KIDNEY.

Origin.—Not known.

Foliage.—Haulm tall and vigorous, open, medium spreading. Stem, colour 3; extends into midrib of leaf; very dark at base and at nodes. Wings waved, more especially the lower ones. Leaf grey-green; leaflet soft, slightly wrinkled, dull and hairy; secondaries intermediate.

Flower.—Short and inconspicuous; pale blue-purple with white tips; scanty; buds drop readily.

Tubers.—Long kidney (finger shaped). Skin deep purple; smooth. Eyes medium depth and evenly distributed. Flesh white with occasionally slight purple colour at the eyes. Sprouts purple.

Maturity.—First early.

Notes.—An excellent garden variety on account of the very good quality of the tubers. Seldom grown commercially on account of the shape of the tubers. No certified stocks are available.

BRESEE'S PROLIFIC.

Origin.—Probably similar to the American Bresee's Prolific, a seedling of Garnet Chili raised in 1861, and brought into commerce in 1869.

Foliage.—Haulm of medium vigour and height, open and spreading; almost trailing. This habit is very characteristic. Stem, colour 0-1; more pronounced at axils of leaves and leaflets; tend to zigzag and bend at the nodes. Leaf small, light to medium green; leaflets widely spaced.

Flower.—White, scanty; flower-stalk short and clusters small.

Tubers.—Flattened oval to kidney, seldom very large. Skin smooth, and of a pale straw colour, turning pale flesh colour on exposure to light; more pronounced on immature tubers. Eyes shallow, mainly at rose end. Skin round eyes pink, and the eye (generally three buds) picked out in deeper colour. Sprouts pink.

Maturity.—Early main crop.

 *Notes*.—A fair variety for light land, but rather susceptible to late blight and internal brown fleck. Large areas of Bresee's Prolific have been grown in the past under the name of Magnum Bonum and Early Puritan. Northern Star is a common impurity, but is easily recognized by its upright habit. Certified seed is available.



FIG. 9. BRESEE'S PROLIFIC.

BRITISH QUEEN.

Origin.—Raised by A. Findlay, and introduced into commerce in 1894.

Foliage.—Haulm medium height, vigorous, compact, branching. Stem, colour 2. Wings only very slightly waved. Leaf open and rigid, dark green, glossy; leaflets broad; secondaries small and fairly numerous.

Flower.—Creamy-white, numerous; clusters very large and conspicuous. Flower-stalk bronze-coloured; buds dark.

Tubers.—Oval to blunt kidney. Eyes shallow, with well-developed brow or even shoulder overhanging the eye. Skin white and smooth. Flesh white. Sprouts pink.

Maturity.—Second early.

Notes.—Commonly grown in Great Britain. In trials under local conditions it has given only fair yields even when good seed was available. Not recommended. No certified stocks available now.

BROWNELLS (TASMANIAN).

Origin.—Introduced into Tasmania in 1905 under the name of Adirondack. Under local selection several types have been produced; a parallel to our Auckland Short Top and Auckland Tall Top selections.

Foliage.—Haulm tall and vigorous, upright, open, exposing the stem. Stem, colour 2, developed throughout and showing in midrib of leaf and in flower-stalk. Wings waved, especially the lower ones. Leaf medium green, crinkled; secondaries small and numerous.

Flower.—Tall and prominent, red-purple with white tips, large and numerous; persistent.

Tubers.—Round. Skin russet pink. Eyes medium to deep, particularly at rose end deep pink. Flesh white. Sprouts deep pink.

Maturity.—Main to late crop, depending on type.

Notes.—The main variety of the Tasmanian export potato trade. It is a good cropper and very good keeper. Unfortunately all the local stocks are badly affected with mosaic, and results have been misleading.

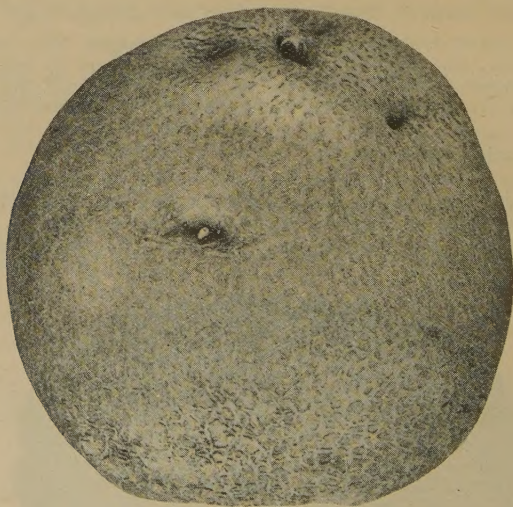


FIG. 10. BROWNELLS (TASMANIAN).

BURBANK.

Origin.—An American variety from an Early Rose seedling. Raised by Luther Burbank in 1871, and introduced into commerce by J. H. Gregory, Massachusetts, several years later.

Foliage.—Haulm medium tall and vigorous, dense, and somewhat spreading. Stem, colour 0-1, branching. Leaf medium green; leaflets long, narrow, tapering to a point.

Flower.—White, moderate bloomer; buds inclined to drop.

Tubers.—Long cylindrical, inclined to be spindle-shaped. Skin creamy-white, smooth. Eyes medium depth and well distributed. Eyebrow distinct. Flesh white. Sprouts pink.

Maturity.—Main crop.

Notes.—Has not proved satisfactory on account of the spindly shape of the tubers and the marked tendency to second growth. Russet Burbank, although an improved selection of better quality and producing shorter tubers, cannot be recommended. No certified stocks are available.

CATRIONA.

Origin.—Raised and introduced by A. Findlay in 1920.

Foliage.—Haulm medium height and vigour, compact, spreading. Stem, colour 2. Wings waved. Leaf fairly close, drooping, slightly arched; leaflet medium to dark green, glossy, margins generally waved.

Flower.—Light blue-purple, tipped white; fairly numerous; small; buds dark.

Tubers.—Kidney, long oval, regular. Skin yellow splashed blue-purple in and about the eyes. Eyes shallow. Flesh lemon. Sprouts blue.

Maturity.—Second early.

Notes.—A good garden and show variety, but susceptible to late blight and mosaic. Not recommended for commerce. No certified lines available.

CHAS. DOWNING.

Origin.—Not known.

Foliage.—Haulm vigorous, medium height, medium dense, semi-spreading. Stem, colour 0-1, very slight. Wings waved but inconspicuous. Leaf open, flat, medium green; leaflet smooth and fairly dull; secondaries small and few.

Flowers.—Numerous, white, large, medium height. Flower-stalk fairly slender.

Tubers.—Oval to round, flattened. Skin white, smooth. Eyes medium depth, mainly towards rose end. Flesh white. Sprouts pink.

Maturity.—Second early.

Notes.—Only grown as a garden variety where it does well under good conditions. No certified stocks available.



FIG. II. DAKOTA.

DAKOTA.

Origin.—Produced in America in 1883.

Foliage.—Haulm tall, vigorous, moderately open. Stem, colour 3, extending to flower-stalk and leaf-midrib. Leaf medium green; leaflet medium size, drooping; secondaries small.

Flower.—Tall and prominent, white, fairly large, moderately numerous.

Tubers.—Oval flattened, tapering to rose end and deeply notched at heel end. Flesh white and crisp, with sometimes a little colouring near rose end. Eyes very deep and evenly distributed. Skin rough, and red in colour. Sprouts deep pink.

Maturity.—Late main crop.

Notes.—The most valuable red potato, and second only to Aucklander Short Top as the most popular variety grown in this country, on account of its excellent keeping and cooking qualities, and its ability to crop well on the warm light lands of Mid-Canterbury. Leader and Scotia are both serious rogues, but since the introduction of certification have been eliminated from most stocks.

DI-VERNON.

Origin.—Raised by A. Findlay and introduced by him in 1922.

Foliage.—Haulm medium height and vigour, spreading open. Stem, colour 2, mottled, strongly developed in axils of leaves and in flower-stalk. Wings waved. Leaf dark green, glossy, drooping; secondaries small and numerous.

Flower.—Blue-purple tipped white, not numerous; buds dark purple, drop readily; flower-stalk long.

Tubers.—Long oval kidney. Skin yellow, mottled blue-purple, particularly at rose end. Eyes shallow, blue-purple. Flesh lemon. Sprouts purple.

Maturity.—First early.

Notes.—A garden variety, rather susceptible to virus and late blight. Very similar to Catriona, which is taller, more dense, and has lighter coloured buds. No certified stocks are available.

DUKE OF YORK.

Origin.—Raised by W. Sim, Aberdeenshire, and introduced to commerce by Messrs. Daniels in 1891.

Foliage.—Haulm low to medium height, open and straggling. Stem, colour 0, or only trace in lower portion. Wings straight. Leaf light yellowish-green, open, drooping; leaflets long, pointed; secondaries fairly numerous.

Flower.—Very rare, white; buds generally drop.

Tubers.—Kidney (pear-shaped). Eyes shallow. Skin yellow. Flesh very yellow. Sprouts pale pink.

Maturity.—First early.

Notes.—A very popular variety in Great Britain, but not likely to become so in this country on account of its very yellow flesh. No certified seed is available.

ENDURANCE.

Origin.—Unknown, probably of American origin.

Foliage.—Haulm fairly tall and vigorous, upright and open. Stem, colour 1. Wings waved. Leaf crinkled, medium-green, fairly open; secondaries small and few.

Flower.—White; medium to numerous; flower-stalks medium height.

Tubers.—Large and sometimes irregular, oval to kidney, often flattened at heel end and notched. Skin white; moderately smooth, sometimes flaked. Eyes medium to deep, evenly distributed. Flesh white and crisp. Tubers somewhat similar to those of New Zealand White Elephant, except they are not so coarse and misshapen and show no colour at heel end. Sprouts pink.

Maturity.—Early main crop.

Notes.—A good cropper particularly on light land, but so susceptible to late blight and the tubers are so brittle that it is of practically no commercial importance. No certified stocks are available.

EPICURE.

Origin.—Raised by J. Clark from a cross between Magnum Bonum and Early Regent. Put on the market by Sutton and Son in 1897.

Foliage.—Haulm fairly tall, upright, open, and vigorous. Stem, colour 2-3 (bronzed, very marked for a white variety). Wings prominent, lower ones waved. Leaf dark green, glossy, drooping; leaflets small, narrow, pointed; last pair generally overlap terminal; secondaries medium numerous.

Flower.—White, rare; buds dark green, drop readily; flower-stalks short.

Tubers.—Round and irregular, deeply notched. Skin white, turning pink on exposure to light. Eyes deep. Eyebrow raised. Flesh white. Sprouts pink.

Maturity.—First early.

Notes.—The most important first early in New Zealand on account of its good cropping and general hardiness. Bolters occur frequently and are much taller and later, and flower profusely. On account of their heavier cropping, lines of a bolter type have in some cases replaced the original Epicure where its extreme earliness is not required. Should always be dug as an early, because when left to mature the tubers are very susceptible to brown fleck (rust). Certified seed is available.



FIG. 12. EPICURE.

ECLIPSE.

Origin.—Raised and introduced by J. Harris, Blackpill Nursery, Swansea.

Foliage.—Haulm of medium height and vigour, open and spreading. Stem, colour 3, very well developed towards maturity. Wings slightly waved. Leaf light to medium green, fairly open; leaflets small and rounded; secondaries small and few.

Flower.—White, rare, buds dark pink at base, drop readily; flower-stalk short and coloured.

Tubers.—Oval, tendency to broaden at heel end. Skin white. Eyes shallow and mostly at rose end. Flesh white. Sprouts pink.

Maturity.—First early.

Notes.—Has proved only a fair cropper under local conditions, and cannot be recommended for more than garden culture or for exhibition. No certified stocks are available.

EARLY REGENT.

Origin.—Raised by Robert Fenn, Sulhampstead, and introduced by Sutton and Son about 1892.

Foliage.—Haulm spreading, compact, of medium height and vigour. Stem, colour 0-1. Wings slightly waved. Leaf light yellowish-green, terminal leaflet large and broad; secondaries fairly numerous, rounded.

Flower.—White, occasional, large; flower-stalk fairly short.

Tubers.—Oval, notched at heel end, distinctly flat on underside and rounded on the upper. Skin white and smooth. Eyes few and shallow, mainly on the upper surface and towards the rose end. Flesh white. Sprouts pink.

Maturity.—First early.

Notes.—Mainly of importance as a garden variety. Crops are grown in the South for the seed trade of the North Island where the variety is popular in gardens on account of its high quality. Not recommended to be grown unless a definite market for the seed is available. Certified lines are available. A high-yielding bolter line has been produced, and certified seed of this also is on the market.

EARLY ROSE.

Origin.—A seedling of Garnet Chili raised in America in 1861, and introduced into commerce in 1867.

Foliage.—Haulm of medium height and vigour, fairly dense and spreading. Stem, colour 1-2 (more than on Beauty of Hebron). Wings moderately waved. Leaf medium to dark green; open, colour at base of leaflet-stalks; leaflets fairly large and pointed; secondaries few and small.

Flower.—White, moderately numerous (very prolific in bolter type); flower-stalk long.

Tubers.—Long oval-pointed; often notched at heel end. Skin even pink all over, fairly smooth. Eyes medium deep. Eyebrow distinct. Flesh white with streaks of pink. Sprouts deep pink. (There is no variation in colour around the eyes as can be observed in a freshly dug Beauty of Hebron, and the sprouts are also deeper pink than that variety.)

Maturity.—Second early.

Notes.—This variety has played an important part in the history of potato improvement, and is regarded as the fountain-head of many present-day varieties. It is in demand for gardens, but is not of commercial importance on account of its brittleness and poor keeping-quality. Certified seed is available. A very coarse, long-tubered bolter is produced.

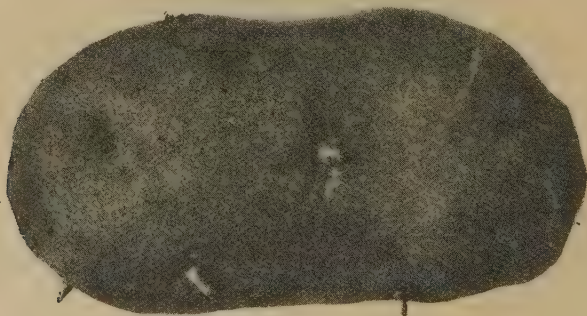


FIG. 13. EARLY ROSE.

EARLY PURITAN.

Origin.—Said to be a seedling of Beauty of Hebron, and introduced into commerce in America in 1888. It is synonymous with the true American White Beauty of Hebron, but not with the New Zealand White Beauty of Hebron.

Foliage.—Haulm of medium height and vigour, spreading and medium dense. Stem, colour 1. Wings slightly waved. Leaf medium green and glossy; secondaries very small.

Flower.—White, fairly numerous ; flower-stalk long.

Tubers.—Oval, pointed, often flat at heel end. Skin white and smooth. Eyes medium deep. Eyebrow long and distinct. Flesh white. Sprouts pink.

Maturity.—First early.

Notes.—A good cropper for a first early, but too susceptible to disease, particularly late blight, to be of commercial importance. No certified stocks are available, and indeed it would be difficult to find pure crops, despite the fact that a good deal of seed is sold under the name of Early Puritan.

FIELD MARSHAL.

This variety is identical with Up-to-Date except that the tubers have a russet skin.



FIG. 14. FIELD MARSHAL.

GREEN MOUNTAIN.

Origin.—An American variety.

Foliage.—Haulm tall and vigorous, fairly erect. Stem much branched, colour r. Wings prominent, straight. Leaves large, medium green ; leaflets broad, slightly drooping.

Flower.—White, numerous ; flower-stalk fairly long.

Tubers.—Oval, flattened, with blunt ends. Skin dull white, sometimes slightly netted. Eyes fairly shallow, mostly at rose end. Flesh white. Sprouts pink.

Maturity.—Main crop.

Notes.—Has been tried under local conditions but proved too susceptible to late-blight infection to be of commercial importance. It is also susceptible to mosaic. No certified stocks are available.

GOLDEN WONDER.

Origin.—Raised by J. Clark, Christchurch, England, from a seed-ball of Early Rose. Introduced to commerce by Brown, Peashell Farm, Arbroath, in 1906. Langworthy is identical except that it has a white skin.

Foliage.—Haulm tall, vigorous, open and very upright. Stem, colour o-r. Wings not constant. Leaf medium to dark green, open ; leaflets wrinkled (mosaic often present) ; secondaries small and few.

Flower.—Purple with white tips, fairly numerous ; fall early ; flower-stalk long.

Tubers.—Kidney (pear-shaped). Skin thick russet brown. Eyes shallow, mainly at rose end. Flesh white to pale lemon. Sprouts blue.

Maturity. Late main crop.

Notes.—A splendid-quality potato and excellent keeper, but not likely to become of commercial importance on account of producing a large proportion of small tubers, and on account of its dirty brown appearance. Very susceptible to mosaic. No certified lines are available.

GOLD COIN.

Origin.—An American variety introduced into commerce about 1903.

Foliage.—Haulm of medium height and vigour, spreading and open. Stem, colour 0-1. Leaf light green; leaflets small.

Flowers.—White, rare; buds green, drop off readily; flower-stalk short, green.

Tubers.—Large, long oval, flattened. Skin light creamy brown; smooth to rough. Eyes moderately deep. Flesh white. Sprouts pale pink.

Maturity.—Main crop.

Notes.—A good cropper on good land, but too susceptible to late blight to be of commercial importance. No certified seed is available.

GREAT SCOT.

Origin.—Raised by G. Mair, of Lockerbie, in 1906, and introduced to commerce by A. W. McAlister, Dumfries, in 1909. Sefton Wonder is identical with Great Scot, except that the skin of the tuber is russet.

Foliage.—Haulm tall, upright, open and vigorous. Stem, colour 1. Wings straight. Leaf dark green and glossy, drooping at tip; leaflets medium size; secondaries fairly well developed.

Flower.—White, rare, buds generally drop off; flower-stalks very short.

Tubers.—Round, often dented at heel end. Skin yellowish white, rough. Eyes medium, but deep at rose end. Flesh white. Sprouts pink.

Maturity.—Second early to early main crop.

Notes.—A variety that deserves to be grown more than it is at present. A good cropper considering its earliness. Not susceptible to late blight, and a good keeper. On light land a somewhat high proportion of small tubers is produced, and on heavy land the large tubers are subject to hollow-heart. Certified seed is available.

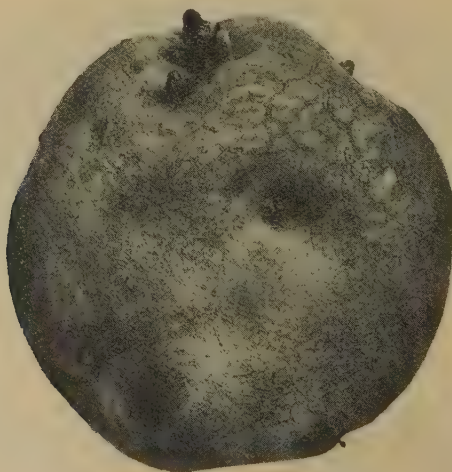


FIG. 15. GREAT SCOT.

HERALD.

Origin.—Raised by Messrs. McGill and Smith, Ayr, and introduced by them in 1927.

Foliage.—Haulm of medium height and vigour, open, becomes spreading at maturity. Stem, colour 1. Wings straight. Stem branched. Leaf medium green, long, and drooping; leaflets fairly large and pointed, glossy; terminal leaflets often tied; secondaries fairly large, few.

Flower.—White, small, rare; flower-stalks long.

Tubers.—Oval. Skin white. Eyes shallow. Flesh white. Sprouts purple.

Maturity.—Early second crop.

Notes.—Although attractive in shape it crops poorly for its maturity and is not recommended. No certified stocks available.

INCOMER.

Origin.—Raised and introduced by C. Brown, Pitnappie, Newtyle.

Foliage.—Haulm tall, upright, vigorous, and compact. Stem branched, colour 2. Wings mostly straight. Leaf close; leaflets dark grey-green, dull, long, broad, cupped; secondaries numerous and pointed.

Flower.—White, not numerous; buds pink, drop readily; flower-stalk short.

Tubers.—Short, oval. Skin white. Eyes shallow. Eyebrow indistinct. Flesh white. Sprouts pink.

Maturity.—Late main crop.

Notes.—Has been tried locally, but produced too many small tubers to be of commercial importance. No certified stocks available.

IRISH COBBLER.

Origin.—Said to be a sport from Early Rose in 1876 in United States of America. Known in Great Britain under the name of America.

Foliage.—Haulm of medium height and vigour; semi-erect. Stem, colour 2. Wings waved. Leaf slightly arched, fairly close; leaflets medium green, large, rounded; secondaries fairly large and numerous.

Flower.—Light reddish-purple with white tips; large, fairly numerous; flower-stalks long.

Tubers.—Round, heel end often depressed. Skin white. Eyes fairly deep. Eyebrow fairly long and distinct. Flesh white. Sprouts pink.

Maturity.—First early.

Notes.—Too susceptible to mosaic to be of commercial importance in this country, although a very popular variety in America. No certified stocks available.

IRON DUKE (PRESIDENT).

Origin.—Raised and introduced by G. Veenhuizen, Sappemeer, Holland, in 1896, and known in Holland as Paul Kruger. The variety General is identical with President except that its flowers are white.



FIG. 16. IRON DUKE (PRESIDENT).

Foliage.—Haulm tall, upright, open, and vigorous. Stem branched, colour 1. Wings waved. Leaf open, erect, and rigid; leaflets large, broad, distinct light to medium green colour; secondaries small.

Flower.—Red-purple distinctly tipped white, numerous and persistent; flower-stalks long.

Tubers.—Round to oval, slightly flattened. Skin white and rough. Eyes medium. When mature the skin around the eyes sometimes shows a pink tinge. Eyebrow distinct. Flesh white. Sprouts pink.

Maturity.—Late main crop.

Notes.—A heavy cropping variety, which can be recommended for rich land. A good keeper and fairly resistant to late blight. Generally infected with mosaic, but very tolerant to that disease; degeneration is very rapid when infected with leaf-roll. Certified stocks are available.

(To be continued.)

STAGGERS IN LIVE-STOCK.*

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Wallaceville.

THE term "Staggers" is much used by New Zealand farmers to describe a variety of diseases in horses, sheep, and cattle. It should be remembered, however, that a staggering gait or inco-ordination of movement is a symptom of many diseased conditions. Discrimination is shown by the farmer when the term is applied to grass-staggers of dairy cows, rye-grass and paspalum staggers of stock, and to a less extent in stomach staggers of horses. Such conditions as bloat and milk-fever of dairy cows, ante-partum paralysis and circling disease of sheep, arthritis in lambs, all produce some inco-ordination of movement in an affected animal as does tuberculosis of the brain, but not in such a way as to warrant the term "staggers."

Only the first four conditions mentioned are considered herein.

STOMACH STAGGERS OF HORSES.

Brief reference to stomach staggers of horses suffices, for one rarely sees it. When it does appear it means that the horse is seriously ill with acute inflammation of the stomach. In such cases it is advisable to get veterinary help as soon as possible.

RYE-GRASS STAGGERS.

Rye-grass staggers affects sheep, cattle, and horses, together with the young of those species. Nothing is more alarming to an owner, on going out one morning, than to find a large number of sheep taking what appear to be fits as soon as they commence to move. Rye-grass staggers is seen usually after a dry autumn on paddocks in which rye-grass is predominant. Usually rain has fallen a few days previously, so that probably there is a short quick growth just commencing. Up till then the paddock has been dry and bare. The symptoms in the milder cases, usually in horses and cattle, are an inability to move rapidly, the legs being stiff; a board-like motion of the whole body in turning, a swaying movement of the hindquarters, a tendency to fall with recovery only by an effort, staring eyes, and laboured breathing. When

* Portion of lecturette broadcast from Station 2YA.

the animals are not disturbed no symptoms are noticeable, grazing takes place quite naturally, yet there is a disinclination to lie down. If the affected animals are startled the legs move spasmodically, and great difficulty is experienced in placing the feet where required. Occasionally horses and cattle fall and find difficulty in regaining their feet. Sheep usually are affected acutely. When the dog is sent round almost the whole flock will start running, then prance shortly with head held high. The body sways, the eyes roll, and the sheep then falls over unconscious, legs straightened, head back, eyes twitching and rolled back, and body trembling. After a few seconds relaxation occurs and consciousness returns, the sheep regains its feet and runs a few more yards before repeating the performance. Death rarely occurs and post-mortem analyses of organs and blood and sections of brain, liver, &c., prepared for the microscope do not show any recognizable change.

For some years rye-grass staggers has been associated with ergot, which is seen as a long black banana-shaped fungus in its sclerotia stage on the seed-heads of rye-grass, cocksfoot, and tall fescue. Certainly ergot will cause a dry necrosis of the lower part of the leg well known to many; but it also is known to act on nerves at times, particularly when there is any shortage of vitamin A, as occurs in the dry pasture in the late autumn. The actual stage in which this species of ergot is harmful to the nervous system is not yet known, but from circumstantial evidence one would suspect that the honey-dew stage, the stage of sporulation, is responsible. As the grass is not seeding but is particularly short when staggers occurs, many hold that ergot cannot be held responsible, but it is usual to find ergot in considerable quantity lying on the ground in paddocks where staggers occurs in the stock.

Rye-grass ergot fed experimentally in the sclerotia stage to sheep at Wallaceville did not produce anything but ulceration of the stomach and tongue of the sheep.

The feed of animals affected with rye-grass staggers should be changed—for example, a change to danthonia from rye-grass is quite efficacious. Within a week nothing abnormal can be seen. Where it is impossible to change paddocks, hay should be fed, and, where conditions allow, Epsom salts may be placed in the drinking-trough at the rate of 20 lb. to 200 gallons of water. Valuable horses can be given stimulant-powders, but that method of treatment is too expensive for cattle and sheep. Animals left entirely alone will recover slowly, but there is the danger of their being caught up in fences, drowned in drains, &c. Dogs should be used as little as possible throughout an attack of this disorder.

PASPALUM STAGGERS.

Paspalum staggers is very similar to rye-grass staggers. In New Zealand the condition is rare, and was seen this autumn for the first time. It is common in South Africa, however, and parts of the United States of America where the paspalum is infested with a species of ergot. In our explanation of the paspalum pasture in the Waikato and North Auckland ergot was found in large amounts, but the plants were also badly infested with another fungus—a species of *Fusarium*, which American workers say affects paspalum flowering-heads only when the spores of ergot are present. Paspalum staggers mainly affects cattle, but may be seen in horses and occasionally in sheep. One owner

said, "My cows are all drunk, what shall I do with them?" That remark is a satisfactory summing-up of the appearance of the trouble. Cattle have a swaying gait, find difficulty in walking, tremble excessively, and have staring eyes. Breathing is laboured, and some animals salivate freely. Rarely they fall, in which case the legs are frequently stretched out behind them. They have difficulty in rising.

At the time of the investigation the paspalum had been eaten down, but was quite green and had come away with great rapidity following warm rain. Seed-heads had grown to maturity in from two to three weeks. The leaves of the plants appeared free from blight. Cattle were eating the heads. One owner had thirty cows affected on the first morning, fifty the second, and seventy-eight the third, and had great difficulty in getting them to the shed for milking. The supply of milk was not badly affected, for if left quiet the animals chew the cud and behave normally, but move round stiffly. They are, however, very easily frightened. In about five days from the time of first seeing the nervous symptoms the animals appear almost normal, though, if driven, they get very excitable, as evidenced by a mob of fat bullocks driven to the meat-works a fortnight after the attack.

The best method of treatment is to remove the stock from paspalum if possible. If not, they should be put in the barest paddock, and fed hay so that they will eat less of the grass. They quickly recover. Symptoms are more alarming than dangerous. Nothing abnormal is to be seen in post-mortem examination of the cattle affected—many were closely examined in the meat-works.

The ergot of paspalum is a brown berry-like excrescence of 2 mm. to 4 mm. in diameter, attached to the seed-heads, often in considerable numbers. As with rye-grass ergot the fungus falls to the ground and when opportunity occurs forms spores. The paspalum seed-head is not kept in check by stock to the same extent as that of rye-grass, and therefore stock could the more easily eat quantities of the growing ergot. Stock, however, do not eat paspalum seed-heads unless they are hungry following droving, or unless the pasture tends to get somewhat short. That the paspalum ergot in the brown sclerotia stage is capable of producing staggers was tested out in Mississippi, United States of America, and in South Africa: 8 lb of seed-heads will cause acute staggers. Further, twenty-four ergot bodies fed to guinea-pigs daily for a week kills the guinea-pigs, while fifty bodies fed on one day causes nervous symptoms.

Paspalum seed-heads gathered at North Auckland are now being fed to experimental rats in the Wallaceville Laboratory to find just how toxic the material is.

GRASS STAGGERS.

Grass staggers is a disease of dairy cows in which the cow becomes affected from two to six weeks after calving, and in which there is a very high death rate. The name grass staggers is a poor one, and others such as grass tetany, eclampsia, &c., have been used. It is only within recent years that much has been known of this serious condition. Usually many cases are to be seen in August and September in the Waikato and the Bay of Plenty. Sometimes cases occur in the Gisborne, Manawatu, and Wairarapa districts. Taranaki is as yet free, though it may not remain so always. There seems to be a reason why certain districts are more frequently affected than others. Usually they are

rich areas heavily top-dressed with superphosphate and inclined to be deficient in lime and in magnesium. Milk-fever is usually prevalent on the same farms as is grass staggers, or in districts affected with grass staggers.

The symptoms of the disease vary from mild to acute. In mild cases cows walk stiffly or stand about twitching or trembling slightly, and are easily frightened. Such cases may, when being driven to the yard or during milking, drop down in a fit, and may even die at that stage. The stage is acute when the cow is found in convulsions and unconscious, eye turned back and twitching, and often showing paddling movements of the limbs. To get such cows conscious and on their feet has been very difficult in the past, but with an increase in our knowledge results of treatment during the past two years have been better. The blood of such cows is very deficient in magnesium and to some extent in calcium. There is an antagonistic action between calcium and magnesium in the blood in their action on nerves. Calcium irritates nerves and magnesium has a soothing affect on them. With too little magnesium the calcium has had the upper hand, and the cow becomes irritable, nervous, and highly strung, sufficiently so at times to charge the owner without much provocation. When the magnesium is replaced the cow once more regains its placidity.

Treatment then consists in replacing the magnesium. This can be done by drenching with Epsom salts—*i.e.*, sulphate of magnesia—if the cow be lightly affected. There is, however, always the danger of the cow taking convulsions during the act of drenching. It is better in mild cases for the cows to drink water from a water-trough which is kept medicated with Epsom salts, say 1 lb. to 20 gallons water. Should the cow be affected acutely it requires injection of Epsom salts under the skin, and this should be done by a veterinarian, who can gauge the amount the animal may take without causing death.

Prevention, however, is by far the best course to adopt. Many farmers know when to expect trouble, usually after the hay and silage are finished, and when the spring flush of grass appears. Actually the whole of the year's growth of pasture has been slightly deficient in magnesium and lime, but this is accentuated to a dangerous degree, one thinks, by the high phosphate-content of the young grass in the spring. Experimental trials have been made with both the sulphate of magnesia and with a mineral known as dolomite, which contains much magnesium, and both have been found helpful. As soon as cases are noticed on the farm it is wise to add Epsom salts to the water-troughs, keeping the ball-cock tied up— $\frac{1}{2}$ per cent. solution is tasteless and if kept constantly before the cows wards off the trouble. Where water-troughs are not available Epsom salts can be spread on silage or dampened hay for the cows during the latter part of the winter. Ground dolomite has been used also as a lick and spread on silage or hay. On two farms a trial is being made with dolomite sprinkled throughout the silage while it was being stacked, so that magnesium is incorporated from the start, and cows must get it during the winter to store for the after-calving period.

Considerable experimental work on assimilation of magnesium by stock has been and still is being carried out at Wallaceville, and an all-the-year-round analysis of grass is being made from certain farms in the Waikato, where the disease is prevalent.

PREVENTION OF MOULD-GROWTH ON BOX-TIMBER.

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WOODEN cases used for the package of various commodities such as butter, soap, canned goods, &c., when exposed to damp conditions frequently become disfigured by mould-growth. From the cases the mould is apt to spread to the contents, causing discoloration and spoilage of bulk-packed commodities such as butter or of the container or label of packeted goods. The experiments detailed in this article were designed to find a practicable method whereby such case-wood might be treated to render it permanently unsuitable for mould-growth.

Previous work on the control of moulds on timber* had failed to find a substance that would efficiently control moulds and be suitable for use in connection with foodstuffs. In discussing the matter with the research chemists of the Imperial Chemical Industries, Ltd., at Manchester, it was suggested that one or other of the salicylanilide products might be suitable for the purpose. The water-soluble sodium salt of salicylanilide, sold under the trade name "Shirlan, W. S.," appeared to be the most promising, and it was with supplies of this material, kindly provided by the above company, that the following experiments were carried out.

Shirlan W. S. is a white powder completely soluble in cold water, making a solution, at the dilutions used, that is colourless, odourless, and tasteless. It should also be completely harmless in the quantities likely to gain access to contained foodstuffs from treated case-timber.

EXPERIMENTAL METHOD.

Blocks of $\frac{1}{4}$ in. white-pine (*Podocarpus dacrydioides*), butter-box timber 2 in. square, treated and untreated, were inoculated by dusting with spores of the commoner box mould fungi (*Cladosporium herbarum*, *Alternaria* sp., *Penicillium expansum*, *P. puberulum*), (and with pieces of culture of *Pullularia pullulans*), placed on filter paper germinator pads in petri dishes, 10 c.c. of water being added to each dish, and incubated for from five to fourteen days at 22° C. Preliminary experiments showed that, while a treatment by immersion for ten minutes or more in a solution of 0.1 per cent. Shirlan W. S. prevented the growth of all the moulds enumerated, the results of inoculations on the untreated blocks varied with different blocks even when cut from the same board. Good growth took place on those blocks of peripheral sap wood which contained available nutriment for the moulds, but little or none on pieces cut from more central portions of the tree. To overcome this difficulty it was found that, by boiling the blocks for one hour in Czapek nutrient solution followed by thorough drying, it was possible to ensure

* NEILL, J. C., The Control of Mould Fungi in Dairy Factories and Meat-works, N.Z. Journ. Agric., Vol. 48, pp. 70-75; 1934.

maximum growth on all blocks irrespective of their nature. In the following experiments all the material was so treated, and inoculations were made with *Cladosporium herbarum* (Black-spot mould), since this mould appeared to be the most resistant to treatment, is readily seen with the naked eye, and is the commonest mould to develop on case-timber.

EXPERIMENT 1.

To determine Minimum Time and Concentration of Steep.—Wood blocks were immersed for periods of two seconds, one minute, four minutes, six minutes, and ten minutes in solutions of Shirlan W. S. at 0.01, 0.025, 0.05, 0.075, and 0.1 per cent. at 58° F., dried, inoculated, and incubated. Examination in seven days showed profuse growth on the untreated control blocks, and an amount varying inversely with time and concentration of dip on the treated blocks. Since the maximum time and concentration of ten minutes at 0.1 per cent. still permitted some growth of the mould, these figures were taken as the minimum for further experiments.

EXPERIMENT 2.

To determine Effect of Temperature of Steep.—Wood blocks were immersed for ten minutes at 0.1 per cent. Shirlan W. S. held at 58°, 100°, 120°, 140°, 160°, 180°, 210° F., dried, inoculated, and incubated. Examination in seven days showed no differences in growth of the mould up to 160°. At 180° and 210° growth was rather more marked.

It appeared, therefore, that no useful purpose would be attained by raising the temperature of the steep.

EXPERIMENT 3.

To determine the Optimum Minimum Time and Concentration of Steep.—Wood blocks were immersed for ten, thirty, and sixty minutes in solutions of Shirlan W. S. at concentrations of 0.1, 0.25, 0.5, 0.75, and 1 per cent., dried, inoculated, and incubated. Two blocks were used for each treatment, and the untreated control blocks were soaked in water for corresponding times, dried, inoculated, and incubated. The results of examination in five days are given in the following table:—

Treatment.	Time of Immersion.					
	10 Minutes.		30 Minutes.		60 Minutes.	
	A.	B.	A.	B.	A.	B.
Shirlan W. S. 0.1 per cent. ..	x	x	x	x	x	x
Shirlan W. S. 0.25 per cent. ..	x	x	o	x	o	o
Shirlan W. S. 0.5 per cent. ..	x	o	x	o	o	o
Shirlan W. S. 0.75 per cent. ..	o	o	o	o	o	o
Shirlan W. S. 1 per cent. ..	o	o	o	o	o	o
Water only ..	x	x	x	x	x	x
Control (not steeped) ..	x	x				

x Indicates some mould-growth.

On re-examination after a further incubation period of ten days *Cladosporium* colonies had developed on all blocks, their relative extent being best shown in the accompanying photograph of one block from each series.

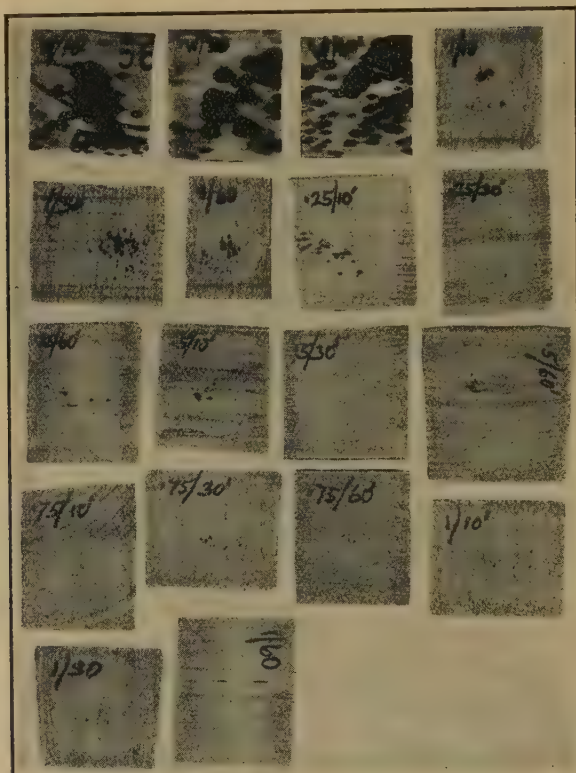


FIG. 1.

It will be seen that, compared with the three untreated blocks marked W/10, W/30, and W/60, the development of mould on the series at 0.1 per cent. and on the 10-minutes steep at 0.25 per cent. was relatively small, while on the rest of the series it was practically negligible.

EXPERIMENT 4.

Practical Test on the Control of Mould on Butter-boxes.—This experiment was conducted in conjunction with the Dairy Research Institute in connection with an investigation on the relative qualities of various types of butter-boxes. Full details of this investigation are embodied in a special report, therefore only a graphical summary of the results in so far as they affect the control of mould by Shirlan W. S. will be given here. Sixty-five half-hundredweight export butter-cases were used in the experiment. Those treated with Shirlan W. S. were kept immersed, before making up, in a 0.1-per-cent. solution at about 56° F. for ten minutes. They were then air-dried for four days, made up, and those to be inoculated sprayed on the inner surfaces with a water suspension of *Cladosporium*

herbarum, spores and mycelia, grown on wood. The boxes were then lined with parchment, packed with butter, and closed in the normal way. After packing, the boxes of butter were stored for seven days at 14° F., then removed to a room held at temperatures from 70° to 80° F. with minimum ventilation and maximum humidity for ten days. Before stacking in this room the boxes were repeatedly dropped from a height of 3 ft. to simulate damage in handling. This resulted in many of them being "sprung" at the corners with openings which admitted air freely to the inner surfaces with consequent heavy condensation of moisture. The boxes were then opened and examined. The moulds present included species of *Cladosporium*, *Penicillium*, *Fusarium*, *Alternaria*, and *Mucor*.

A graphical summary of the results is provided in the appended table, in which the number of crosses indicates relative severity of mould infection :—

Type of Box.				Not inoculated.		Inoculated.	
				Untreated.	Treated.	Untreated.	Treated.
A	..	..	..	X	O	XX	X
B	..	..	..	XX	O	XX	X
C	..	..	..	XX	O	XXX	X
D	..	..	..	XXXXX	X	XXXXX	X
E	..	..	..	X	O	XX	X
F	..	..	..	O	O	X	O



FIG. 2. SPECIMENS OF D AND E TYPES OF BOXES AT EXAMINATION.

These results indicate that the treatment renders butter-box timber extremely resistant to mould-growth.

SUMMARY OF EXPERIMENTAL RESULTS.

(1) The degree of mould-growth on blocks of white-pine timber varied widely even on blocks cut from the same board.

(2) Consistent maximum growth on all blocks was obtained by a preliminary impregnation with Czapek nutrient solution.

(3) Steeping such blocks in sodium salicylanilide, followed by drying, rendered them resistant to subsequent mould-growth.

(4) The degree of resistance obtained varied directly with both concentration and time of immersion.

(5) Increase of steep temperature did not render the treatment more efficacious.

(6) Complete immunity from mould colony formation was not obtained at times and concentrations up to sixty minutes at 1 per cent. Shirilan W. S.

(7) A degree of resistance sufficient for most practical purposes was obtained by immersion for ten minutes in a 0.1-per-cent. solution of Shirilan W. S.

APHIDES AFFECTING CULTIVATED PLANTS.

(4) APHIDES OF THE PEACH, PLUM, AND APPLE.

W. COTTIER, Entomology Section, Plant Research Station, Palmerston North.

APHIDES in the orchard are often of very great economic importance—*e.g.*, the green and black aphides of the peach and the black aphid of the plum. Any one of these can at times cause great damage. The spring is usually the period at which most damage is done, the succulent developing foliage on stone fruits frequently being severely stunted and curled, the insects thickly encrusting the young growth.

On the peach in New Zealand there commonly occur three aphides, one, the green aphid, *Myzus persicae*, and the others the brown or black aphides, *Anuraphis schwartzi* and *A. persicae-niger*. On the plum occurs the black aphid, *Rhopalosiphum nymphaeae*, while on the apple the two most characteristic are the woolly aphid, *Eriosoma lanigerum*, and the green aphid, *Aphis pomi*.

For the convenience of those who might wish to distinguish between the various species; the two common forms of each aphid are described below in language as simple as possible. Both these forms are viviparous—*i.e.*, producing living young—one form is winged and the other is without wings. Those who might require details of the terms used in the descriptions will find them in No. 2 of this series in this *Journal* for May, 1935.

Aphides of the Peach.

THE GREEN APHID (*MYZUS PERSICAE*).

The wingless viviparous female of this species is most commonly a whitish-green to dark green, but it also may be shades of pink. This wingless form is usually 1.5 mm. to 2 mm. long and presents a

somewhat flat appearance. The antennæ are slightly shorter than the body, the frontal tubercles project inwards, and the cornicles are usually slightly swollen at or near the middle.

The winged viviparous female has four wings, the front pair being much larger than the hind pair. The head and thorax are black, while the upper surface of the abdomen is greenish with black bands and has a large black patch in the centre. The cornicles are usually very dark and are swollen at or near the middle. The antennæ are approximately as long as the body. Length of the insect is 1.5 mm. to 2 mm.



FIG. 1. TYPICAL APHIS INFESTATION ON YOUNG GROWTH.

[From Quaintance and Baker, U.S.D.A.]

HOST-PLANTS IN NEW ZEALAND.

M. persicae has been taken from the following plants: Potato, tomato, *Brassica* spp., peach, beet, garden peas (*Pisum sativum*), docks (*Rumex* spp.), fat-hen (*Chenopodium album*), nightshade (*Solanum nigrum*), *Hebe* sp., Californian thistle (*Cirsium arvense*), *Daphne* sp., *Lilium* sp., *Chrysanthemum*, *Cineraria*, pansy, chickweed (*Cerastium vulgatum*), and tobacco.

OBSERVATIONS.

In the southern portions of New Zealand this aphid passes the winter in the egg-stage on the peach-tree. In the late autumn sexual forms appear, the winged male and the wingless female, this being the only occasion on which the male appears in the life-cycle. The female lays eggs on the wood at the bases of the buds, these eggs at first being light in colour, but they soon change to shining black. The eggs hatch in the spring, when the buds burst and there is succulent green foliage upon which to feed. However, in the warmer climates this aphid can pass the winter in the summer form on any suitable plants that happen to be in leaf at that time of the year. *Brassica* spp. are favourite food-plants in the winter, and the green aphid can be found on these hosts all the year round. Thus it is possible that in the spring a peach-tree or orchard can be infested from neighbouring *Brassica* spp. or other hosts.

THE BLACK PEACH APHIS (*ANURAPHIS SCHWARTZI*).

The wingless viviparous female of this species is really very dark brown and is approximately 1.5 mm. long. The antennæ are shorter than the body, which is globular and shining.

The winged viviparous female is almost the same colour as the wingless form and is approximately the same length. The antennæ are about as long as the body.

HOST-PLANTS IN NEW ZEALAND.

Peach and nectarine.

OBSERVATIONS.

In Palmerston North the writer has found the shining black eggs of this aphid laid at the bases of the buds on peach-wood in winter. The life-cycle is similar to that of the green aphid, the eggs hatching in the spring to infest the young green foliage. As a pest *A. schwartzi* does not appear to be as notorious in this country as does the green aphid, but it has been reported as causing severe damage by curling the developing leaves.

THE BLACK PEACH APHIS (*ANURAPHIS PERSICÆ-NIGER*).

This aphid is often called by English writers the "Black Peach Aphid of America." To the ordinary observer there is no apparent distinction between this species and the preceding one. Separation of these two species requires a microscopic examination.

HOST IN NEW ZEALAND.

Peach.

OBSERVATIONS.

The damage caused by this aphid is again not usually comparable with that caused by the green aphid.

It is reported that this species migrates to the roots of the peach to pass the winter. As soon as the buds burst in the spring aphides migrate from the roots to the aerial parts of the tree and pass the summer there. With the approach of winter they return to the roots.

The Aphides of the Plum.

THE BLACK APHIS (*RHOPALOSIPHUM NYPHAEÆ*).

The wingless viviparous female is approximately 2.5 mm. long. It is very dark green to almost black in colour, with the antennæ shorter than the body, which is globular.

The winged viviparous female is much the same colour as the wingless form. The insect is approximately 2 mm. to 2.5 mm. long, with the antennæ shorter than the body.

HOSTS IN NEW ZEALAND.

The known hosts are plum and apricot.

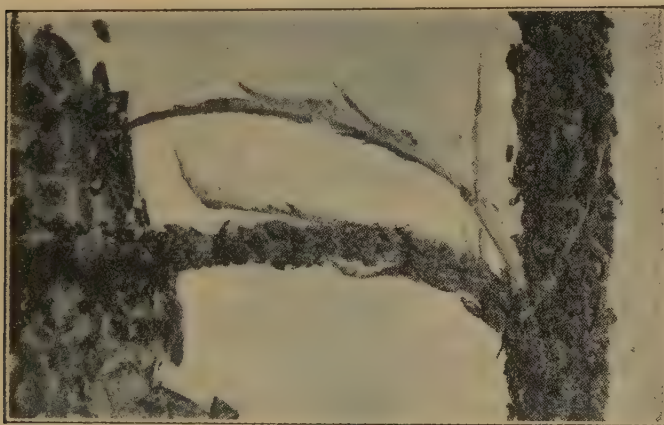


FIG. 2. APHIS ON PLUM.

[From U.S.D.A. Farmers' Bull. 908.

OBSERVATIONS.

*No details of the life-history of this aphid in New Zealand are available. In other countries the insect passes the winter in the egg-stage on the plum, the spring foliage of which is often severely damaged by the hatching aphides. In the summer the aphides leave the plum and migrate to various water-plants, such as water-lilies and various water-weeds. In the autumn they return to the plum to lay their eggs. In New Zealand this aphid is often the cause of severe damage to plums in the spring, the young shoots being heavily laden with the lice.

Apple Aphides.

WOOLLY APHIS (*ERIOSOMA LANIGERUM*).

Most growers are familiar with this pest, and it has not been thought necessary for the purposes of this article to describe it.

HOSTS IN NEW ZEALAND.

Apple.

*Recently (July) the writer observed the eggs of an aphid, most probably *Rhopalosiphum nymphaeae*, at the bases of the buds of twigs of plums.

OBSERVATIONS.

This species causes swellings on the wood of infested trees. Before the introduction of the parasite *Aphelinus mali* this aphid was a serious pest in the orchard, but the success of *A. mali* in New Zealand has been so great that orchardists no longer fear this insect.

THE GREEN-APPLE APHIS (*APHIS POMI*).

The wingless viviparous female is green, with the cornicles black. The antennæ are not quite as long as the body. The insect is 1.5 mm. to 2 mm. long.

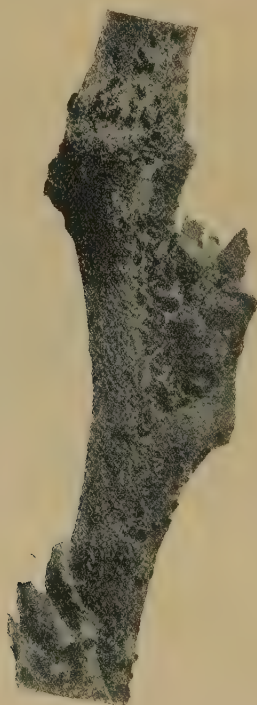


FIG. 3. APHIS-EGGS ON TWIG (MUCH ENLARGED).

[From N.Y. Agr. Exp. Sta. Memoir 24.

The winged viviparous female has the head and thorax black, while the abdomen is green. The antennæ are shorter than the body. Length of insect approximately 1.5 mm.

HOSTS IN NEW ZEALAND.

Known hosts are apple and pear.

OBSERVATIONS.

This aphid is very common on apple and pear, and seems to attack particularly the young shoots of pear, on which it can cause severe damage. On apples, however, this aphid does not seem to be of much

importance. The life-history in New Zealand has not been followed. In other countries, however, eggs are laid in the autumn to carry the insect over the winter, the whole life-cycle being passed on the apple or pear.

CONTROL MEASURES.

There are two methods of spraying for control of aphides on fruit-trees. One is by applying a tar-distillate spray in the dormant season to kill the over-wintering eggs, and the other is to spray with a contact insecticide, such as nicotine sulphate plus soap, in the growing season. The most recent development in the control of the green aphid on peach is to spray with tar-distillate washes in the dormant winter period. In the southern districts of the South Island where this aphid is known to over-winter on the peach-trees in the egg-stage this method is to be recommended. The tar-distillate is applied at the rate of 1 part to 30 parts of water in the truly dormant period before any buds are moving. The tar-distillate spray can also be used as a winter wash against the eggs of the black peach aphid, *Anuraphis schwartzi*. In districts where the black plum aphid, *Rhopalosiphum nymphaeae*, is troublesome in the spring a thorough examination of the trees should be made in the winter to determine whether the black shining eggs have been laid at the bases of the buds. A very careful examination is required, because each egg is considerably less in size than a pin-head. If such eggs are found, a spraying with tar-distillate emulsion should be made at 1-30 in the really dormant period, since if there is any movement in the buds injury will most probably result. The only disadvantage in the use of the tar-distillate emulsions is that they are liable to cause a slight inflammation of exposed portions of the operator's skin, and it is advisable to protect the face by smearing with vaseline or by using a suitable mask. Spraying can be carried out from June onwards, but must be finished before the buds show any movement. The tar-distillate emulsions are prepared for spraying in the same way as are the ordinary oils—viz., the required amount of distillate is added to the same amount of water, this mixture being thoroughly emulsified before being added to the bulk of the water. There are several satisfactory proprietary brands of tar-distillate washes on the market.

The tar-washes cannot be used on any tree in foliage, the spray to use in the growing-period being nicotine sulphate 1 part to 800 parts of water, plus soap at the rate of 2 lb. to 3 lb. per 100 gallons of spray. The most important period to attack the aphides with this spray is in the spring, when the young succulent growth of the tree is often severely checked and stunted by the feeding of these pests, and it may be necessary to make persistent use of the nicotine spray at this period.

The green aphid of the apple, *Aphis pomi*, is usually of very little significance on apple, and probably does not call for treatment. If a spray is required the use of nicotine sulphate in the growing season as described above usually is sufficient. The same applies to this aphid on pear, where it is often quite serious.

As far as the woolly aphid of the apple is concerned, the success of the parasite *Aphelinus mali* has been so great that the need for spraying for this pest has largely disappeared.

GARDEN - PEA VARIETIES.

AGRONOMY SECTION, Plant Research Station, Palmerston North.

A STUDY of eighteen New Zealand seedmen's catalogues reveals the fact that forty-seven differently named garden-pea varieties are offered, and as many as thirty-three in a single catalogue. Amateur gardeners who desire to purchase seed of a few varieties must be greatly puzzled at times to make a choice from the many so attractively described, and it is hoped that the following notes may be of some assistance to them in this respect.

VARIETY.

In contrast to most other self-pollinated plants the garden pea is subject to variation, and indeed it seems impossible to attain such permanent uniformity as is possible in such a plant as wheat. In this state of constant instability it is often easy to develop by selection strains which differ one from the other to varying degrees, and it is difficult to decide just what degree of variation between two strains should be regarded as sufficient to warrant their recognition as two varieties.

In the first place, many of the varieties are catalogued under two or more names. Some growers know a variety by one name, others by another, and therefore both names are included. In the second place many of the varieties may have been at one time distinct selections, and therefore were given different names, but the distinction, if any, has disappeared or is so slight as to defy description, or can be observed only when the selection and the parent varieties are grown together. For all practical purposes they may be regarded as the same, since both will serve equally the one purpose, and both have generally the same origin. Finally, in such well-known varieties as Daisy, Stratagem, and others distinct strains have been selected, and, although distinctions can be drawn, they continue to be sold under the one original name.

MATURITY.

The catalogued descriptions might lead one to expect a wide range in maturity between varieties, but when they are sown together under uniform conditions a surprisingly large number of them mature together. The earliest varieties grown at this Station have been Benefactor and Early Market, the latest, Autocrat. The former carried filled pods in seventy-three days and the latter in one hundred days.

The period between sowing and picking depends also upon other factors. Thus early-spring sowing lengthens the period, and late-spring sowing shortens it. Rich land induces luxuriant growth and consequently delays maturity.

In general, early maturity is associated with a reduction in yield, and this is true whether the early maturity is induced by varietal differences, by the time of planting, or by soil conditions.

HEIGHT.

The height of the plant is not in any way associated with maturity. Tall varieties may be as early as dwarfs. Dwarf varieties are most popular, however, because they may be grown with the minimum of staking, especially if sown in double rows from 9 in. to 12 in. apart.

In general, dwarf varieties, especially the extreme dwarfs, are very poor in yield, when compared with medium-straw varieties, and if the difficulties associated with staking could be overcome the more prolific varieties would be grown more extensively. One or two notes may therefore not be out of place in discussing this matter of staking.

Peas will climb ordinary sheep or rabbit netting to a height of 5 ft. or 6 ft. with very little attention, and the same netting can be used for many seasons (fig. 1).

A method now adopted even for commercial plantings is to drive in firmly at intervals of 4 yards or 5 yards stakes 6 in. by 1 in. by 5 ft. high. The peas are sown in double rows 9 in. apart and later hilled. As the



FIG. 1.

Left : Medium-straw peas climbing on 3 ft. wire netting.

Right : At a later stage the vines require an occasional tie-back to prevent them breaking away from the netting.

vines grow, fine lacing-wire is run down both sides of the double row at an appropriate height, lightly stapled to the intermediate stakes, and firmly stapled to the end stakes. Thus the vines are confined within the width of the battens by two strands of wire. Three or four sets of wires may be necessary in a medium-straw variety. The extra yield and quality of pods under this system more than compensates for the trouble and expense entailed.

YIELD AND ADAPTABILITY.

Garden peas are highly specialized in their requirements, and a variety that gives a satisfactory yield in one district may not perform

as well in another. The more popular varieties, like Greenfeast, are those that grow equally well in all districts. The discussion on varieties which is to follow applies mainly to experiences at this Station and therefore may not be true of all districts. This reservation is implied in all recommendations made.

PODS AND PEAS.

Large pods and peas are always desirable, but well-filled pods are desirable above all else. The colour of the peas will generally follow that of the pod, and should preferably be of a deep green. Some varieties like Daisy and Yorkshire Hero are handicapped in this respect, having peas of a pale-green colour, while one of the attractive features of Stratagem is its deep-green colour.

VARIETIES CATALOGUED.

In the catalogues to which reference has already been made fourteen varietal names are mentioned in at least nine cases out of a possible eighteen. Of these only eleven out of the fourteen may be regarded as distinct varieties. It may be concluded from the evidence of the catalogues that these eleven varieties are those most in demand, and therefore the most popular in New Zealand. Some comments on these eleven varieties will now be made.

Greenfeast.—This variety (known also under the names of Lincoln and Homesteader) is mentioned in every catalogue. It is deservedly the most popular variety, and should dominate all others in both private and commercial gardens. Its popularity is due no doubt to its hardiness, heavy yields, and wide adaptability. The pods are not large, and are very curved, but contain as many as ten dark-green peas of medium size. In the size of pods it falls short of such varieties as Stratagem. The vines grow to a height of about 3 ft. 3 in., and maturity is mid-season.

Stratagem is mentioned in all catalogues, and with it may be included Dwarf Defiance (mentioned thirteen times) and Te Aroha (nine times), making a total of forty. This is the outstanding quality pea, and in popularity ranks next to Greenfeast. Granted rich land and ample moisture Stratagem will give heavy yields of large straight dark-green pods containing seven or eight very large bold dark-green peas, which for culinary purposes are ideal. The vines are about 3 ft. in height, and maturity late. A considerable variation is to be observed in the lines of Stratagem, Dwarf Defiance, and Te Aroha offered by seedsmen.

William Hurst.—This is the only other variety mentioned in all catalogues, and one must conclude that it is in general demand. Why this should be is difficult to understand. It has been grown at this Station for several years, the seed being obtained from different sources, but it has, without exception, proved to be one of the poorest varieties grown. On the evidence of these trials there is no justification for its recommendation. It is a dwarf 1 ft. 6 in. in height, and as grown here matures as a second early.

William Massey is the local name for Kelvedon Wonder, and is mentioned in sixteen catalogues out of eighteen. Of the early varieties this is to be highly recommended. Like Greenfeast it has a wide range of adaptability, and the two varieties sown at the one time form an



FIG. 2.

(a) Greenfeast ; (b) William Massey ; (c) Senator.



FIG. 3.

(a) Stratagem ; (b) Daisy ; (c) Lord Chancellor.

excellent combination, William Massey being ready to pick before Greenfeast. The vines are about 2 ft. 6 in. in height, producing a heavy crop of pods of medium size, containing up to eight peas of a medium-green colour.

Daisy, a well-known and popular variety, is mentioned in fourteen catalogues, and the Rev. Dr. Stuart in eight, making a total of twenty-two. The two varieties may be regarded as synonymous, but the position is obscured by the fact that, while the true "Carter's" Daisy is a dwarf 2 ft. 6 in. in height, there is another type, a medium-straw Daisy attaining a height of 3 ft. 6 in. to 3 ft. 9 in., which, in every other respect, is similar to the true dwarf type. The demand in the trade is for the dwarf form, although the yield is not as great as that of the medium straw. In many respects Carter's Daisy may be likened to Stratagem, but can be distinguished on account of the pale-green colour of foliage, pods, and peas. It is also decidedly earlier and more dwarf than Stratagem, and the pods and peas are not as attractive in appearance. It is, nevertheless, a variety that can well be recommended for general garden culture.

English Wonder is mentioned fourteen times and Richard Seddon twelve. Like William Hurst, this variety has consistently proved disappointing in all trials at this Station. It has rarely attained a height exceeding 9 in. to 12 in., each plant producing a very few small pods. On this evidence it cannot be recommended, although, as in the case of William Hurst, it may suit certain districts.

Yorkshire Hero (Great Crop).—Prior to 1926, at which time Greenfeast commenced to be known, Yorkshire Hero was perhaps the most popular variety. Its origin dates as far back as 1862, yet it is still in demand, has a wide range of adaptability, is a vigorous grower, and gives very heavy yields. The pods are short and blunt, containing relatively few peas, and these, although large, are very pale in colour. The vines attain a height of about 3 ft. 6 in. and maturity is mid-season. Its height and prolific growth, short pods, and pale peas, render it less desirable than Greenfeast as a garden variety, although in actual yield it will generally prove to be equally as good.

Sherwood.—This early dwarf variety has been grown only once at this Station. The pods were satisfactory in size and colour, but the general vigor and yield proved disappointing.

American Wonder is generally catalogued as an early dwarf, but at least two strains are available. One is as tall and as late as Yorkshire Hero, producing a prolific crop of small blunt pods each containing a few medium-sized pale-green peas. The other is more dwarf and far less productive, but neither strain can be regarded as a true early, nor can either be regarded as of high quality. It seems probable that the strains available in New Zealand differ materially from the original American Wonder, which originated as far back as 1875.

Little Marvel.—An early dwarf variety attaining a height of about 2 ft. and producing a prolific crop of short blunt pods very well filled with eight dark-green peas. A satisfactory variety for garden use.

Blue Bantam.—This variety has become very popular, largely, it may be assumed, on account of the large dark-green pods and peas, associated with its dwarf and early habit. In many respects the variety is

similar to Pioneer and Peter Pan, except that in trials at this Station Blue Bantam was decidedly more dwarf, slightly earlier, and less prolific. This variety, or one of those of the same general type such as Pioneer, Peter Pan, Hundredfold, Laxton's Progress, and Laxtonian, can well be recommended for culture in private gardens.

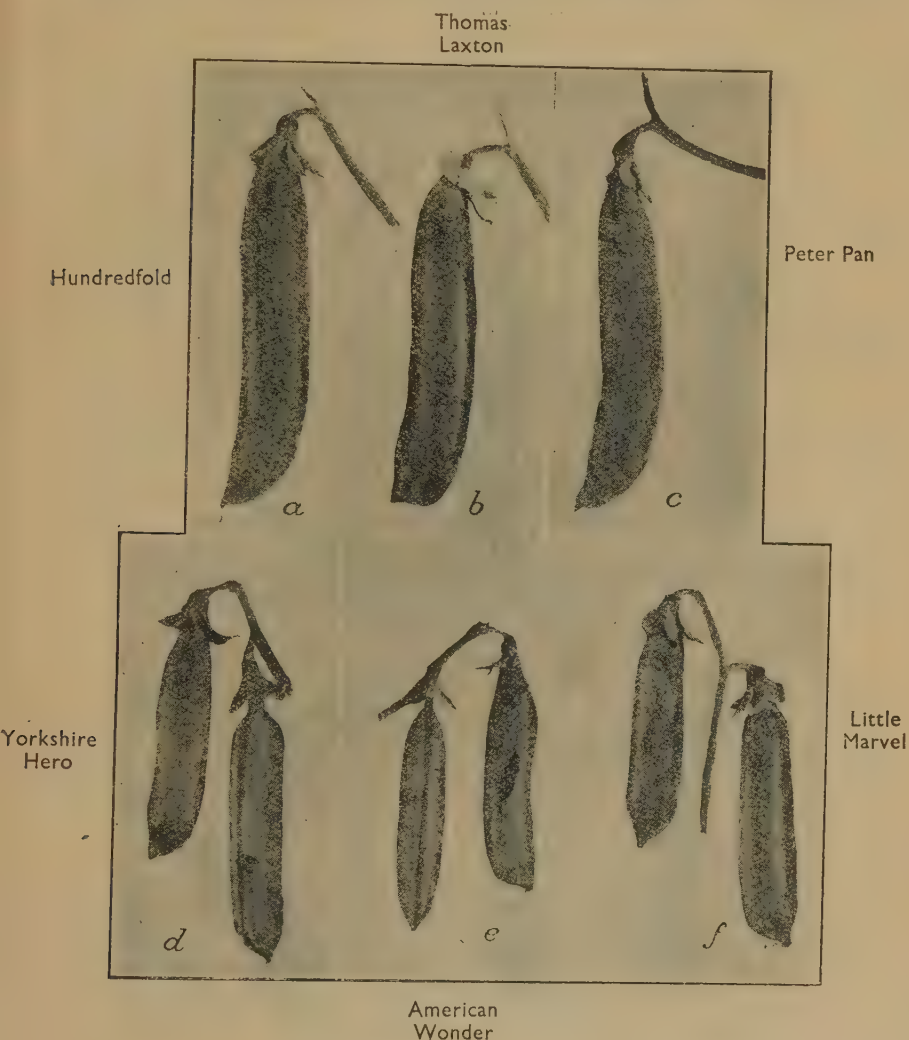


FIG. 4.

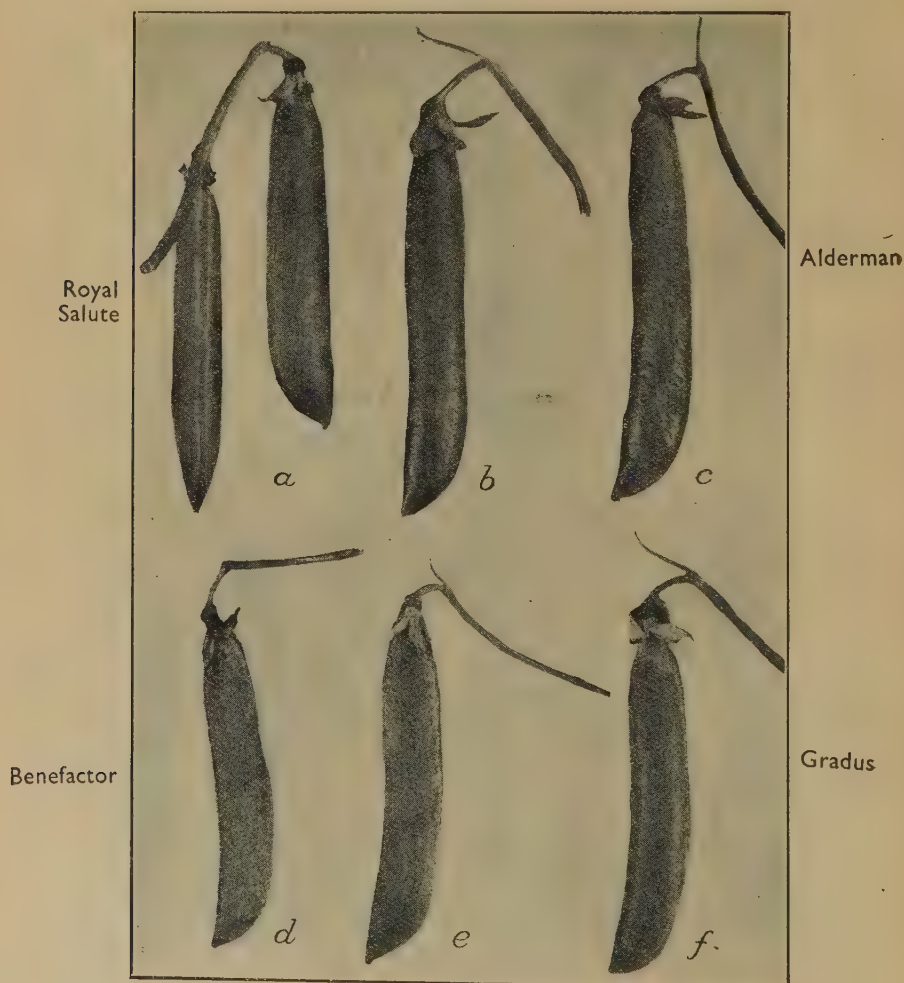
(a) Hundredfold; (b) Thomas Laxton; (c) Peter Pan; (d) Yorkshire Hero; (e) American Wonder; (f) Little Marvel.

VARIETIES NOT COMMONLY GROWN.

The varieties so far discussed are those apparently best known to private and commercial gardeners. The bulk of them are of dwarf growth, a few of medium straw, but none of them is tall. By excluding

all tall varieties the private gardener limits the range of varieties that might be grown with advantage, and excludes some of those that attain the highest quality. A few of the varieties that have given a satisfactory performance at this Station might therefore be mentioned.

Admiral
Beatty



Laxton's
Progress

FIG. 5.

(a) Royal Salute, (b) Admiral Beatty; (c) Alderman; (d) Benefactor; (e) Laxton's Progress; (f) Gradus.

Of all varieties tested the earliest have been Benefactor and Early Market, followed by Thomas Laxton. These attain a height of about 4 ft., are non-branching, and require careful staking. The pods are

large, well-filled, and the yield satisfactory for such early maturity. At the other extreme is Autocrat, always the latest to mature. It is of an extremely vigorous habit, attaining a height of 4 ft., and producing an abundant crop of dark-green pods and peas of high quality.

Gradus and Admiral Beatty are both tall, second-early varieties that have given consistently good results, and when staked produce a prolific crop of handsome pods. Alderman is mid-season, and grows to a height of 5 ft. or 6 ft. The large, handsome pods and peas are dark-green and of the highest quality. Duke of Albany may be regarded as synonymous with Alderman, and both varieties are catalogued in New Zealand.

Senator is a branching and vigorous variety, attaining a height of 3 ft. 6 in. to 4 ft., and producing a remarkably heavy crop of pods which, however, contain few peas, and these are pale green in colour. Union Jack and President are dark-podded forms of Senator. The pods are curved as in Greenfeast.

Lord Chancellor and Royal Salute are indistinguishable one from the other. Growth is vigorous, attaining a height of about 3 ft. 6 in. The pods are large and dark-green in colour, but the peas are not particularly large, and the number in the pod is disappointing.

Pioneer, Hundredfold, Laxton's Progress, Laxtonian, and Peter Pan form a group of varieties of very similar characteristics almost any one of which would serve the purpose of the others. They are all early or second early in maturity, and are satisfactory in respect to yield and size of peas and pod. Seed of some or all of them is available, and their cultivation in private gardens could well be extended.

Southern Cross (Onward) is a recent and promising introduction of medium height, pale foliage, and large blunt pods.

SUMMARY.

Summarizing the varietal position in the light of trials conducted at this Station, the following recommendations can be made in respect to varieties of which seed is available as indicated by the catalogues studied :—

Early—

William Massey ; Little Marvel ; Blue Bantam ; Pioneer ; Peter Pan ; and other similar varieties.

Second Early—

Gradus ; Admiral Beatty.

Mid-season—

Greenfeast ; Yorkshire Hero ; Daisy ; Alderman ; Senator.

Late—

Stratagem ; Lord Chancellor.

Crystallizing the position still further to within the scope of the average private gardener, the following may be recommended :—

Early—

William Massey.

Mid-season.

Greenfeast.

Late—

Stratagem.

—J. W. Hadfield, Agronomist, Palmerston North.

CHEWINGS FESCUE SEED.

THE INFLUENCE OF TEMPERATURE AND MOISTURE CONTENT UPON THE RATE OF LOSS OF ITS GERMINATING-CAPACITY.

E. O. C. HYDE, Assistant Seed Analyst, Palmerston North.

THE export trade in Chewings fescue seed from this country has in the past been seriously prejudiced by the frequency with which deliveries have been rendered unsatisfactory through loss of germinating capacity during transport. Recently Foy* has shown that this disability may be removed by shipping seed of low moisture-content in sealed containers. It is anticipated that advantage will be taken of these findings and that the drying of Chewings fescue seed before shipment ultimately will become a general practice.

The methods of drying seed which are being given first consideration are those where the excess moisture is removed by heated air of low relative humidity. When controlling such a drying process it is of advantage to know to what conditions the seed may be submitted without endangering the germinating-capacity. The present work was undertaken with a view to providing information upon this point.

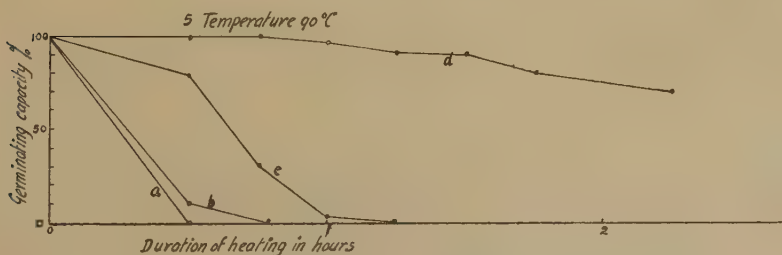
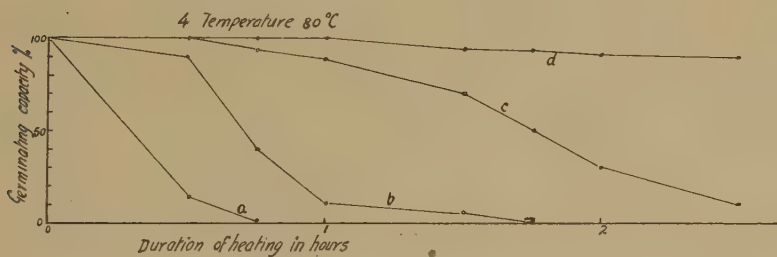
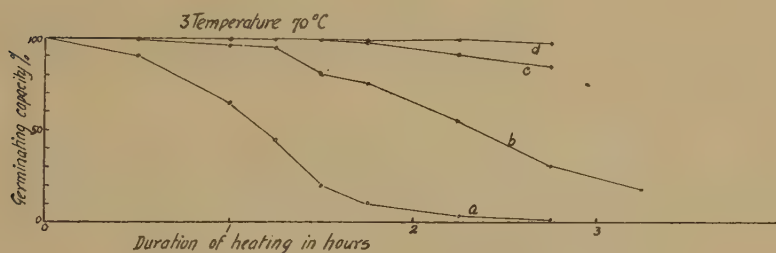
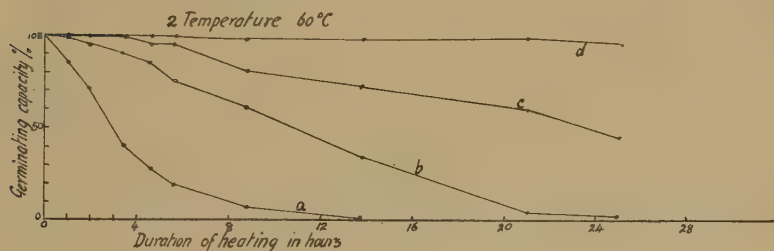
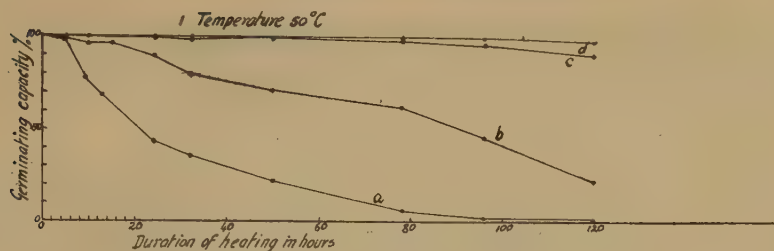
The seed used had been harvested about twenty months previously. The germinating-capacity when received was 78 per cent. and the moisture-content 12.4 per cent.

Four lots of seed were taken from the bulk and the moisture-content adjusted in order to obtain a range between six per cent. and fifteen per cent. To increase the moisture-content of one lot the seed was placed for three hours in a warm chamber over a free surface of water. To reduce the moisture-content of other lots the seed was placed in an electric drying-oven through which a current of air at 40° C. was passed. The seed was removed when the requisite moisture-content was reached. The four lots of seed were then stored for three weeks in sealed containers in a cool place. Before the continuation of the experiment the moisture-content of the four lots was found to be respectively 5.86, 9.36, 12.00, and 15.24 per cent. The germinating-capacity was 78, 78, 76, and 74 per cent. respectively.

The determination of moisture-content was made by heating a weighed quantity of the seed for five hours at 103° C. in a ventilated oven. The seed was then removed to a dessicator to cool before re-weighing. The moisture-content is expressed as a percentage of the dry weight.

The heating treatments were carried out in the following manner: Small samples of each lot of seed in sealed phials of $\frac{1}{4}$ in. diameter were placed in an electric oven at constant temperature. At intervals samples were removed and a record made of the temperature and duration of treatment. Germination tests were made within a week after treatment.

* Foy, N. R.: *N.Z. Journal of Agriculture* (1934), 49 (7), 1.



a	Moisture content	15.24 PC.
b	"	12.00 PC.
c	"	9.36 PC.
d	"	5.86 PC.

The results are presented in the accompanying graphs. The germinating-capacity after treatment is given as a percentage of the germinating-capacity of the untreated control sample. It is very apparent that the resistance of the seed to injury from heating is greatly increased by reduction of the moisture-content.

From a practical point of view it is of special interest to see at what point the germinating-capacity begins to decline. The accompanying table shows the maximum length of time, as determined in these experiments, for which seed of given moisture-content may be heated at specific temperatures without impairing the germinating-capacity.

It is necessary to draw attention to several considerations which tend to diminish the accuracy or limit the usefulness of these results.

Firstly, although the thermostat on the oven was highly efficient, the necessity of opening the oven at intervals to remove samples caused fluctuations in the temperature which, when higher temperatures were used, extended to as much as 3° C. in the seed within the phials.

Secondly, the heating and cooling of the seed necessarily are gradual processes, and this must be a source of considerable error where the duration of the heating is short and the fall in germinating-capacity rapid. Reading from a thermometer inserted within one of the phials of seed showed that when the difference between the room temperature and the oven temperature was 70° C. twenty-one minutes were occupied in raising the seed to the temperature of the oven.

Thirdly, the seed used in the experiments was nearly two years old and had a germinating-capacity of 78 per cent. It may be assumed that this seed would be more susceptible to injury from heat than would be seed of greater vitality. It is considered, however, that this does not militate against the usefulness of the results. If the limits of safety in treating seed as determined in these experiments are taken as a guide, it is improbable that any newly harvested line will suffer injury.

Upon consideration of the present findings, and in the light of experience already gained in the drying of Chewings fescue seed, it can be asserted with confidence that an efficient plant may be operated at temperatures high enough to accomplish rapid drying with yet an ample margin of safety from the danger of injuring the vitality of the seed.

Maximum Period of Heating of Chewings Fescue Seed without Resultant Diminution of Germinating-capacity (in Hours).

Moisture-content (Percentage).	Temperature (Degrees C.).				
	50.	60.	70.	80.	90.
15'24.. ..	5	..(b)	..(c)	..(c)	..(c)
12'00.. ..	8	I	$\frac{1}{2}$	..(c)	..(c)
9'36.. ..	80	3 $\frac{1}{2}$	I $\frac{1}{2}$	$\frac{1}{2}$	..(c)
5'86.. ..	120(a)	2I	2 $\frac{1}{2}$	I	$\frac{3}{4}$

(a) Maximum period used in these experiments.

(b) Significant reductions in germinating-capacity in minimum period used (I hour).

(c) Significant reduction in germinating-capacity in minimum period used ($\frac{1}{2}$ hour).

LIVE-STOCK POISONING IN NEW ZEALAND.

(Continued from May, 1935, Journal.)

POISONOUS PLANTS AS FOODS.

B. C. ASTON, Chief Chemist, Department of Agriculture.

THERE is nothing new in the statement that poisonous plants may be excellent food-plants under certain conditions. In the case of humans the conditions under which a poisonous plant may be used safely for food are so well known and the procedure in preparing it for human food has become so fixed that the necessity for closely observing the right conditions has often been lost sight of and only remembered when a deviation from the routine practice results in illness from eating such abnormally prepared food.

The most striking example of this need for extreme care in following the established practice is the case of the potato, which belongs to a family (*Solanaceae*) containing a number of very poisonous members. The green parts of these plants are usually poisonous, but the fruit when quite ripe is often highly nutritious and palatable, as, for instance, the tomato, the cape gooseberry, the egg plant, &c. Fortunately the unpalatable nature of the unripe fruit usually acts as a deterrent to their consumption even by children. The green parts of the potato are similarly poisonous to human beings, so that cooks usually discard any tubers or parts of them which have become greened by exposure to light. A few years ago very high winds blew away the soil covering from the growing potato crop, exposing large quantities to the light, and as a result several cases of potato poisoning occurred in the North Island that year. Green potatoes should be used only for seed, for which they are more suitable than the blanched tubers. If continuous access of light to the tubers is permitted they become green and poisonous alkaloids are formed, the green colour being the danger signal. Another excellent example of the necessity for following the correct technique in preparing food is that of rhubarb, the stalk of which is highly esteemed as a vegetable food, but the leaf of which is poisonous. During the Great War when vegetables were scarce the poisonous nature of the leaf blade was overlooked, and attempts to utilize it by boiling it as greens resulted in several poisoning cases and even fatalities.

Sometimes it is a question of the relative amount eaten which is the deciding factor whether the plant will exert its acute poisoning effects or not: thus the pepper, mustard, and nutmeg act as poisons when taken in excess, although when taken in the customary quantities with other food they are useful flavouring ingredients or appetite-stimulants. The statement that one nutmeg will kill a man is certainly a striking example of the need for moderation even in the use of a familiar domestic condiment.

The domestic animal may safely be left in most cases to choose the food that is good for it, given a reasonable latitude and range of food materials. The animal, and this includes fowls, penned up or tied up under artificial conditions may eat any poisonous plant within reach. Fowls in a run will eat South African box-thorn leaves (another poisonous solanaceous plant) and die, cattle on turnips will break out and gorge themselves on tutu, resulting in 100-per-cent. mortality. A horse tied to a poisonous tree will browse it with ill results. Starved

driven calves will browse pimelia in default of something else to eat, and a heavy mortality will occur among them, although in their home paddocks where there is no lack of good pasture they will not touch pimelia, which causes blistering of the mouth and throat and must be extremely distasteful to the normal animal.

One exception to the statement that an animal will select food that is best for it if it is available is that curious phenomenon of what is called a drug habit, where the animal obtains some after-effect which for a time stimulates it. This condition may be perhaps compared to that of the opium-eater in the human being. Cattle, after they have once acquired a liking for ragwort, will search out plants in a paddock and eat them in preference to normal pasture. This is also the case with the bracken fern. These plants probably contain compounds which stimulate the action of certain glands, producing a pleasant result in the animal which it becomes desirous of having continued, but the final result is disastrous.

The Karaka (Corynocarpus laevigatus) as a Food Plant.—The ancient Maori knew that the kernel of the karaka fruit was poisonous in its raw state; he also knew that the tutu fruit was poisonous, although in this case very sweet and palatable. In both instances he discovered how to destroy or avoid the poison, and by heating and steeping the karaka fruit in running water and by screening off the poisonous seeds of the tutu made use of palatable farinaceous food in one case and in the other prepared a refreshing sweet drink.

Karaka (*Corynocarpus laevigatus*) is a dark-leaved evergreen tree from 25 ft. to 50 ft. in height, with a trunk from 1½ ft. to 2½ ft. in diameter, and is one of the most attractive small trees of New Zealand. The leaves are very similar in shape and size and general appearance to the well-known cherry laurel, but the fruits, which are more abundantly produced in some years than in others, are large orange-yellow drupes like small plums, which they resemble in size and structure, having an outer soft pulpy sugary covering, the sarcocarp, a tough leathery fibrous inner covering, the endocarp (corresponding to the shell of the plum), and the contents of the shell, the poisonous and bitter-tasting seed or kernel.

It has been said that in times of scarcity of food it is the established practice for the farmers in the Manawatu and Taranaki coastal districts who have karaka-trees on their property to cut down branches, thus enabling the leaves of the karaka to be devoured greedily by cattle. The fruit of the karaka is, however, generally regarded as poisonous taken as a whole, although the pulpy outer cover is fairly palatable and has a flavour which may be likened to that of an inferior date. These fruits, variously called "nuts" or "berries" by the farmer, are undoubtedly poisonous to many forms of life if the kernel is eaten raw. The poison is due to a compound or compounds which under certain conditions evolve hydrocyanic (prussic) acid, one of the most deadly poisons known. The existence of this type of body in small quantities in many fodder plants is known, but only in a few is the quantity sufficient to cause anxiety. In the sorghum and similar plants in certain seasons and at certain stages of growth enough prussic acid is generated to cause mortality in stock. It would appear, however, that the presence of similar cyanide-generating compounds (cyanogenetic glucosides) in the kernel is no bar to their consumption by sheep and lambs, which can consume them not only with impunity, but with great advantage to themselves

and their owner. The karaka probably, therefore, has an additional economic value to the sheep-farmer on account of the food-value of the fruit, especially in times of drought, when the pasture is burned up and there is no other food except the karaka fruit, which drops from the trees in autumn before the rains bring on the pasture. A well-known land-owner at Hawke's Bay recently informed the writer that the sheep are so fond of the fruit that they detect the sound made by the dropping "nuts," which reminds them of new food and prompts them to hasten to the spot, where the falling "nut" is eagerly sought for. Sheep eat the entire fruit, including the kernel. Evidently there is some treatment which the "nut" receives in the digestive machinery of the sheep which inhibits the generation of prussic acid. The most convincing account of the value of karaka fruit as a supplementary food for lambs comes from a Martinborough farmer, who writes under date 8th March, 1935. The letter was kindly sent me by Mr. D. A. Gill, District Superintendent, Live-stock Division, Wellington. "My lambs," he says, "live largely on karaka berries for a period after weaning every year, and this year, as owing to the drought there has been no grass, they have lived entirely on them for some weeks. For roughage they have had nothing but leaves, some fern, and a little dry grass. They do not seem to eat much of the roughage, but prefer to remain under the karaka-trees, where there are more berries than a small mob of 330 lambs can cope with. When I got the lambs in I was more than pleased with their condition. Although they had had no grass they had grown nearly $\frac{1}{2}$ in. wool and put on fat in three weeks. The paddock they were in is $45\frac{1}{2}$ acres cleared and, say, 15 acres bush, mostly karaka-trees. On 26th January I put 330 lambs in it. There was then no grass at all, but the berries were starting to fall plentifully. On 29th March I took them out again. The berries were then over, but grass was plentiful. During the time the lambs were on the karaka paddock they ate $\frac{1}{4}$ cwt. salt lick and 100 lb. maize and 100 lb. linseed nuts—that is only a few handfuls for each of the 330 lambs, but they did not seem to want more." This farmer adds some interesting matter with regard to other animals. The whole berry is eaten by all animals except rats, rabbits, &c., and it is the kernel which contains the nutriment. Sheep, cattle, deer, and goats chew the kernel before swallowing it, while pigs swallow most of it whole and merely digest the pulpy covering, voiding the kernels.

The chemical analysis of the karaka fruit made in the conventional way for indicating the relative food-value compared with other similar food materials is summarized in the following table:—

	Percent- age Water.	Percent- age Ash.	Percent- age Protein.	Percent- age Fat.	Percent- age Carbo- hydrates.	Percentage Phosphoric Acid (P_2O_5).
Beech-nut cake(1) ..	15.1	4.72	18.7	..	..	1.00
Rough rice(2) ..	9.6	4.90	7.6	1.9	76.0	..
Acorns(2) ..	27.9	1.10	3.4	4.4	63.2	..
Karaka pulp (sarco- carp)* ..	10.1	7.47	7.95	..	36.4	0.57
Karaka (kernel)* ..	20.1	2.84	11.70	10.9	45.1	0.36

* Analysed by F. B. Shorland.

The whole karaka fruit therefore compares very well in analysis with the other low-grade foods and food-products.

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- (1) ROBERTS: The Fertility of the Land. MacMillan and Co., Ltd., London; 1897.
- (2) HENRY and MORRISON: Feeds and Feeding. Madison, Wisconsin. The Henry-Morrison Co.; 1920.

SUPPLIES OF PAMPAS-GRASS.

THE means by which pampas-grass is propagated are three—(1) By seed; (2) by wild seedlings; (3) by root-cuttings.

Seeds are obtainable only from Messrs. Sutton and Sons, Reading, England, who supply seed giving a germination test of from 60 per cent. to 70 per cent. for 12s. 6d. per pound; shilling packets are also obtainable. This firm has agencies throughout New Zealand, the chief agents being Messrs. J. G. Ward and Co., Christchurch. It is doubtful if any seed is on sale at present, and it would probably have to be ordered from England. A pound of cleaned seed would contain approximately 1,800,000 seeds.

Seedlings.—Regeneration of pampas from seed takes place in many areas near and north of Auckland City, but attempts to obtain seed from mature plumes gave only a small yield. The Harbour Board, Whangarei, supplies seedlings at 30s. per 1,000. Seedlings, either raised from seed or collected from wild plants, should, of course, be raised to a size suitable for planting out. Planting must be done when all danger of frost is over. When a year old, plants should be large enough to plant out in their final home, the area being securely fenced. The grazing must be rigidly controlled, as continuous grazing by stock will kill the pampas in time.

Root-cuttings.—This is the most precarious method of establishing a plantation of pampas, owing to the heavy mortality which may ensue from droughts. Last year, owing to the unusually dry seasons, plantings of root-cuttings were subject to a higher mortality. Root-cuttings may be obtained from any nurseryman, or from certain farmers in the Hauraki Plains and elsewhere. The price varies, according to the vendor, from 10s. to 50s. per 100.

—B. C. Aston, Chief Chemist.

For Sale at Wallaceville Poultry Station.

SITTINGS OF HEN EGGS.

White Leghorn, 6s. 6d. per dozen, rail or postage free.

From specially-selected stock—

White Leghorn, 12s. per dozen, rail or postage free.

Incubator lots—

8 dozen or more, 5s. dozen, railage free. If to be sent by post, 1s. per dozen extra.

DAY-OLD CHICKS.

	Under 50.	50 to 99.	100 and over.
White Leghorn	1s. each.	11½d. each.	11d. each.
	{ (25 = £1 - 5 - 0.)	(50 = £2 - 8 - 0.)	(100 = £4 - 11 - 0.)

NOTE.—Chicks cannot be sent through the post. Price free on rail, Upper Hutt.

PULLETS.

10 weeks old, 6s. each, available after 1st November.

Orders must be accompanied by the proper remittance. Cheques and money-orders should be made payable to the "Department of Agriculture." Cheques must have exchange added.

Apply to the POULTRY OVERSEER, Wallaceville Veterinary Laboratory, Private Bag, Wellington.

SEASONAL NOTES.

THE FARM.

Feed Utilization of Importance.

OFTEN there are substantial differences in the amounts of butterfat, fat lamb, wool, &c., produced on adjacent farms which naturally are similar. As a rule, the basic cause of these differences lies not in the respective feed-producing capacities of the farms, but in the way in which the feed produced is used and at times modified by grazing treatment. In other words, the production of many farms could be increased materially, with little or no additional cost in respect to such practices as top-dressing, drainage, &c., merely by making more effective use of the feed the land is already capable of producing. Increased production brought about essentially by improved utilization of pastures is directly associated with lowered cost of production so urgently desirable during the current period of relatively low prices of farm-produce. The matter is of importance at this time of the year because much can be done within the next few weeks to foster improved utilization of feed from grassland during future seasons.

An aspect of prime importance is the avoidance, as far as is practicable, both of unduly severe grazing in the winter and early spring and of the development of rough, stemmy growth in the summer, two faults which often occur on the same farm and which commonly can be minimized by (1) extension of the practice of ensilage, (2) the adoption of improved grazing management, and (3) increased production, though not necessarily increased acreage, of such supplementary crops as lucerne, mangels, swedes, carrots, chou moellier, and, when pigs are to be fed, possibly barley and peas. On some farms one or two, on others, all, of these developments are desirable. The objective of all of them is the avoidance of periods of excessive supply of feed alternating with periods of harmful scarcity.

Often an increase in the area for ensilage is a proper initial step, and for this the construction of trenches or pits may be advisable as contributing to the lessening both of the labour and the wastage involved in ensilage. Full particulars about the provision of suitable trenches and pits may be obtained from district officers of the Fields Division. There are very few farms on which either a trench or a pit could not be located suitably, and often all that is called for is the labour of making the excavation, it being possible to dispense quite well with the purchase of material for walls, &c.

At times a useful auxiliary to extension of ensilage as well as to improvements in grazing-management may be closer subdivision by the erection of internal fences, but on a great number of farms much improvement could be made without any additional fencing—for instance, as a rule, reasonably good grazing-management can be carried out on a dairy-farm consisting of nine or more paddocks fairly uniform in feed-production. To obtain good grazing-management such subdivision needs to be associated with alternate spelling and heavy stocking of pastures at intervals as great as is possible, consistent with the type of feed that is suitable for the stock, and with the avoidance of herbage of the stemmy or woody character that is correlated with the development of flower-heads.

As much as is practicable may be done in respect to ensilage and to grazing-management, and the feed-position still remain weak unless some supplementary cropping is carried out. One reason for this is that silage as commonly made is not entirely suitable as a feed for milk-producing animals during the shortage of leafy feed directly available from pastures, a shortage which commonly occurs about midsummer, and subsequently for several weeks. The silage usually available is somewhat fibrous in

comparison with feeds of the nature of soft turnips or green, leafy lucerne which experience has shown to be excellent for use at this season. Another reason is that often it is neither practicable nor advisable to create sufficient reserves of silage. It has to be borne in mind that sufficient reserves of feed, if consisting wholly or even mainly of silage, require to be really substantial; the amount of silage that can be saved in any particular year varies so much with variations in the weather that it is unsafe to place too much dependence on silage unless the amount in reserve provides for the needs of more than one year. When such a reserve of feed cannot be created readily it becomes advisable for the sake of safety to make use of special crops suited to the circumstances. This makes it necessary for many at this stage to consider the amount and location of the grassland it is advisable to put under the plough during the coming season. In planning this, certain facts provide guidance.

Firstly, the special provision made for the critical seasons in which the feed directly available from grassland is below the needs of the stock is frequently inadequate—sometimes markedly inadequate. Particularly in dairying, but also in sheep-farming, there often would be more profitable results were the plough more freely used as a means towards better feeding. Secondly, the breaking-up of many pastures is desirable, because either they are too open or they contain unduly inferior pasture-plants.

Aspects of Sward-improvement.

Commonly sward-improvement is effected by following one of two radically different courses—(1) Breaking up and eventual reseedling after one or more arable crops; (2) ameliorating an established pasture by top-dressing, surface-sowing of seed, &c. According to the circumstances, either of these courses may be advisable.

At times fertilizers have given remarkably good results in increasing the vigour and the yield of the good species in a pasture—one or two dressings of phosphates in certain circumstances may bring clovers, rye-grass, cocksfoot, and dogstail into prominence in pastures in which these species prior to top-dressing fare so badly that it would be easy to overlook their presence. But that the species mentioned be really present, though faring but poorly, is a matter of basic importance; the presence of such species which are capable of responding profitably to better treatment is the basis of any worthwhile improvement. In cases of their absence they, at times, have been introduced successfully by surface-sowing of suitable seed following harrowing or other cultivation drastic enough to provide sufficient loose soil to ensure a seed-bed of some service. A certain amount of risk and uncertainty attaches to the surface-sowing of seed on established pastures, but against this, under favourable circumstances, quite good results have been obtained at a very low cost.

Because of the risk attaching to surface-sowing the standard and generally preferable course is to plough and reseed, usually after a series of arable crops, deteriorated pastures which do not contain sufficient numbers of desirable pasture-plants to ensure a satisfactory amount of improvement following such practices as top-dressing and harrowing. A material advantage of this standard course is that it may provide, immediately after sowing, a high-class pasture. Probably a pasture of equal standard could not be obtained at all by any other means, but if it could, then, as a rule, only gradually and after a considerable interval. Drawbacks to the standard course are the outlay and the labour it involves. Despite these drawbacks, the practice of ploughing and reseeding worn-out pastures, if it is at all possible, should be adopted. The advisability of this has been intensified greatly by the availability through certification of reliable supplies of seed of superior and lasting strains of such important species as perennial rye-grass, white clover, cocksfoot, and red clover. In certain circumstances sward-improvement based on arable work may not be practicable because

of labour or cost considerations, or because of the hilly or sandy nature of the land, or because of both. In this case the advisable alternative course is renovation by top-dressing, surface-sowing, &c.

Causes of Sward-deterioration.

Improvement of swards by whatever means it is carried out is always a relatively costly undertaking. The causes of deterioration, some of which can be eliminated, are therefore of moment. Among the common causes are—

(1) Lack of adequate and available supplies of the materials needed in the nutrition of the plants it is desired to have prominent in the pastures. As a rule the remedy for this is suitable top-dressing, but at times improved drainage is called for as a means of fostering the action of small soil-organisms which improve the availability of plant-food materials, especially nitrogenous ones.

Replacement of rye-grass and cocksfoot by brown-top or other twitches, replacement of white clover by suckling clover, the ingress of flat weeds, such as rib-grass and dandelions, all are indicative of lack of fertility leading to deterioration of pastures and give promise of most satisfactory results from top-dressing, provided the deterioration has not proceeded to such an extent that the superior species have disappeared altogether, but still persist, although weakened and inconspicuous.

If improved fertility through such measures as top-dressing and drainage is needed, then until it receives attention the sowing of good seed of species with requirements above the current level of fertility tends to be futile. At times this seems to be ignored completely. For instance, a sward inferior because of deficiency of plant-food is broken up and arable crops, which impoverish the soil, are grown before the land again is sown in grass. Actually it is not reasonable to expect an improved permanent pasture until the fertility is made greater than it was prior to the impoverishment by the exhausting crops. In such circumstances any cropping prior to the sowing of permanent pastures should serve to increase instead of to deplete the fertility. Though this may seem obvious, in practice it is ignored in those many cases in which such crops as oats, maize, and millet precede permanent pasture, especially when the fertility of the land tends to be below the requirements of the class of pasture sought. If prior cropping has worn out such land, then liberal fertilizing should be linked with the sowing of permanent pasture.

(2) Unsuitable grazing-management often is a substantial factor in sward-deterioration. A very common form of unsuitable management consists of over-severe grazing in the winter and early spring, which has an especially harmful influence on the composition of pastures, when, as frequently, it occurs in conjunction with undergrazing in the summer and autumn. In pastures which repeatedly are overgrazed in the winter and spring and undergrazed in the summer and autumn there may occur readily a decline in perennial rye-grass and an increase in brown-top unless the fertility is above the average level.

(3) A most serious cause of rapid and extensive deterioration of pastures, commencing from a few months after their establishment, is being removed speedily with extension in the use of certified seed of such plants as rye-grass and clovers. The use of strains of these plants, which really are not capable of persisting, even under very favourable conditions of soil and climate, has led to much past rapid deterioration of pastures. A farmer who tolerates such deterioration in the future can blame only his failure to make use of the advances in our grassland work.

(4) Because of the ravages of grass-grubs, pastures may contain so few plants of valuable species as to warrant ploughing as a first step towards the establishment of a good sward by resowing. On the other hand, if the damage caused by the grubs is not too extensive it usually is distinctly

helpful to concentrate, as far as possible, the feeding-out of hay, roots, and other fodder on the areas infested with the grubs. At times the feeding-out of hay made from herbage in which seed-production has taken place brings about the surface-sowing of valuable species in useful amounts. Suitable top-dressing assists by building up the vigour of injured plants, thereby enabling them to develop new roots and to survive.

General Work with Pastures.

Much useful top-dressing may be done in July and August by those whose prior top-dressing programmes have been inadequate. Generally, the use of superphosphate at this season may be recommended. Farmers who seem to be threatened with an acute shortage of feed in August and September may well give consideration to the use in late July or August of sulphate of ammonia or analogous nitrogenous manures. Some guidance relative to this was given in these notes for the previous month.

Grass-harrowing, especially for the purpose of breaking up and distributing droppings, very generally calls for attention during July and August.

Young pastures, and particularly those in which permanency is desired, should be treated with especial care at this season. Sheep, if they are not allowed to graze too closely, are preferable on young pastures to cattle, which increase the danger from "poaching" or "pugging," which should be avoided as far as is practicable and which at times leads to the wholesale establishment of such weeds as thistles, buttercups, and docks. In trying to avoid pugging one may fall into the error of undergrazing of young pastures. Young permanent pastures containing a considerable amount of Italian rye-grass are prone to suffer from undergrazing because of the shading and consequent weakening effect of the Italian rye-grass on more slowly developing species valuable in a permanent pasture.

General Cropping-work.

Especially in the South Island, the speeding of ploughing and other cultivation work, provided the soil is dry enough, is particularly desirable in the preparatory work for cereals, and it is similarly, though not so urgently, desirable in preparation for such crops as lucerne, mangels, and potatoes. When old swards are being broken up for these crops it often is advisable to fit a skimming attachment to the plough in order to bury completely the surface layer with its complement of weeds.

From experience it has become customary, in the principal cereal-growing areas, to sow the bulk of the spring wheat crop in August and early September. The sowing of oats, as a rule, should be carried out as soon as the attention required by the wheat crop allows. Black skinless barley often may be sown advantageously in August.

Autumn-sown cereals, if they are to be utilized eventually for the production of grain or chaff, should be given a final grazing about the end of August. However, if "lodging" of the crop is anticipated, then the final feeding-off may well take place in September. Generally after this feeding-off it is advantageous to tine-harrow cereals: this serves to loosen the trampled surface and to break up and scatter droppings. Spring feeding-off of cereals should be done by stocking heavily for a short period, and this preferably when the soil is as dry as possible.

Harrowing of autumn-sown wheat, if it is somewhat thin, is often advantageous, even if feeding-off has not been carried out: the harrowing tends to increase the tillering and so thicken the crop.

Seed-treatment for the control of disease in spring-sown cereals should not be overlooked. Oats, even if intended not for grain but for chaff-production, should be treated, since chaff from a smutted crop is of less value than chaff from a similar clean crop. Seed-treatment if not carried out correctly may be futile or even harmful. Full information about approved methods of treatment may be obtained from local officers of the Fields Division.

Winter Utilization of Crops.

That winter rations should be suitable in quality as well as in quantity seems sometimes to be overlooked. Merely filling the stomach is not sufficient, the necessary amount of nutriment should also be present. The feeding of roots alone is an illustration: it gives too much watery bulky material in the diet. A contrasting unsatisfactory diet is that provided by straw or poor hay—bulky and indigestible. While it is mainly the bulkiness of the roots which detract from them as an exclusive ration, the straw or poor hay fails on account of both bulkiness and indigestibility. A ration containing roots may be balanced satisfactorily by the use of good hay, but poor hay or straw may call for the use of grain or other concentrates to obtain good results.

In the feeding of silage to sheep 2 lb. to 3 lb. a head daily may be looked upon as a substantial contribution to the ration for the purpose of supplementing a scant supply of fresh grass. If sheep which are to be fed on silage have not consumed it previously, then the silage should be introduced into their keep before they have become markedly low in condition—sometimes sheep start to eat silage only when they have been reduced to a hungry condition, and sheep in fairly good condition can withstand a period of hunger better than ones in weak, low condition.

There is a vital difference between the standard of winter feeding required by dairy cows and that required by several other types of farm stock. For the dairy cow the period in which she is not producing milk should be one of recuperation and of replenishing of important bodily reserves. This can be achieved only if the cow is fed above the standard of mere maintenance and not below it, as is the case when cows not producing milk fall off in condition.

—R. P. Connell, *Fields Division, Palmerston North.*

THE ORCHARD.

Cultivation.

THE importance of early and thorough cultivation of all orchard land cannot be over-stressed. Late autumn or early winter is the best time for ploughing in a cover crop. If there is no cover crop, there is almost bound to be an abundance of green vegetation, which, when turned in at this time, after decay, improves the ground, while the action of frost on the turned-up soil not only helps to sweeten it but pulverizes it as well, the benefit of which will be very noticeable during the necessary subsequent cultivation required to bring the soil to a fine tilth. That portion of land around each tree that cannot be ploughed should be dug, and all decayed leaves, &c., buried if possible before the trees commence growth. This prevents the dissemination of spores of fungi from this source while the buds are opening and very susceptible to attack.

Foundation Sprays.

The success of disease-control depends not only on spraying with the correct mixture, but applying it at the correct time with sufficient force to drive it into every corner and crevice of the tree. Even this is inadequate unless the operator is thorough and every twig, leaf, fruit, and branch of the tree is well covered. It is of the utmost importance that the ingredients should be weighed accurately, for the guessing of weights frequently leads to inefficient disease-control or heavy losses due to spray-burn.

The most effective fungicidal foundation spray for the control of such diseases as leaf-curl, die-back, brown-rot, spot-hole, bladder-plum, &c., is Bordeaux mixture, and the strength recommended is 5-4-50—i.e., 5 lb. copper sulphate, 4 lb. hydrated lime, 50 gallons water. This spray should be applied to all stone-fruit trees. In the case of varieties of peach

and nectarine that are particularly susceptible to leaf-curl, or where one application usually does not give a satisfactory control of any of these diseases, a second application should be made. The time for the first application is at or just prior to the first sign of bud-movement, and the second from seven to ten days later. When an application has been made in the autumn the first spring spraying can be omitted.

The hydrated lime must be of good quality, containing not less than 90 per cent. of slaked lime—*i.e.*, $\text{Ca}(\text{OH})_2$; if the content is less than this, adjustment must be made accordingly.

The dormant spray for the control of sucking insects, such as red-mite, mussel scale, San Jose scale, woolly aphis, mealy bug, &c., should be applied as early as possible after pruning and before there is any appreciable bud movement to pome-fruits and during the dormant period to stone-fruit trees. Winter spraying-oil is indispensable for this purpose, and should be applied at a 3 per cent. concentration, and for San Jose scale, 5 per cent. This percentage is based on the assumption that all spraying-oil is 100 per cent. concentration, but in reality this is never the case, consequently consideration must be given to the dilution required. For instance, if the bulk spraying-oil is 80 per cent. oil and a 3 per cent. concentration is desired, $3\frac{1}{2}$ gallons will be required to make 100 gallons of spray.

To ensure a perfect emulsion, soft water must be used for mixing. Hard water may be softened by the addition of washing-soda at the rate of from 1 lb. to 2 lb. per 100 gallons water. Extremely hard water often requires the addition of a little extra washing-soda to ensure a satisfactory emulsion being obtained. The necessary quantity of spraying-oil (say, 10 gallons) should be measured into a clean container for mixing, and the same quantity of water (10 gallons) poured slowly into the oil, the worker stirring thoroughly while the water is being added. The result, provided the necessary details are attended to, will be a milk-like solution, with no free oil in evidence. The balance of the water (80 gallons) may then be added slowly while the mixture is kept well stirred. This is a contact spray, and kills by asphyxiation the pest for which it is applied. When applying the spray the operator must be thorough, as all pests or their eggs not covered by the solution will survive and subsequently increase in numbers. Furthermore, the spray must be applied with sufficient force to drive it into all corners, crevices, and under loose bark, for it is in such places that many of the pests and their eggs or both are to be found during the dormant season.

Miscellaneous.

Pruning now should be pushed on with the utmost vigour, so that it may be completed before growth commences and so that growers may proceed with other essential work in due season. Prunings should be gathered and burned before bud movement, and large cuts painted with tar.

Spraying-outfits should be given their annual overhaul as early as possible to ensure that there will be no delay when the time arrives to make the first spray application. The hose should also be tested under full pressure at the first opportunity to allow ample time for procuring new hose if such should be found necessary.

Where phosphatic or potassic fertilizers are to be applied, these should be ploughed in now at the deepest ploughing of the year. Further delay in this operation appreciably lessens the beneficial effect of the fertilizers during the coming growing season.

—P. Everett, Orchard Instructor, Gisborne.

Citrus Notes.

The principal work in citrus orchards during the next few months will consist of harvesting the fruit as it becomes ready. In order to obtain the best results this should receive attention each month, as steady supplies of fruit of good quality is an essential feature of all successful marketing operations.

The demand for oversized, coarse, tree-ripened fruit does not warrant its production, and such fruit can be avoided by harvesting at regular intervals. As there is a demand for fruit for peel, all fruit inclined to be coarse and oversized should be allowed to remain on the trees, and later disposed of to the factory for peel or juice purposes. This fruit should never be offered for sale in the open market. It should not be necessary to point out the necessity for offering for sale nothing but the very best fruit, of medium size, smooth in the skin, and practically free from blemish and disease. It is only by doing this that the demand for our locally-grown lemon will increase.

Every care should be exercised when handling the fruit, and this care should commence with the gathering and continue right along until the fruit is despatched to the consumer. Any skin-punctures provide a home for some of the rot-producing fungi, through which losses occur.

The fruit should be gathered when it has reached approximately the sizes that pack from about a hundred and fifty to two hundred lemons to the bushel case, irrespective of whether they are green, silver, or yellow, as these sizes are the most popular with the retailer and the consumer.

Whether growers should handle their own fruit and prepare it for the market after picking is a matter that can best be determined by the grower himself, having duly considered all the factors and the outlay necessary in order to colour, cure, and generally prepare the fruit in a manner that reflects credit upon the industry.

—*L. Paynter, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

The Hatching Season.

If young stock are to make the best development, to lay during the season of dear eggs, and to make the most suitable breeding-stock later on it is advisable that hatching-operations should take place during the next two months, or early in October at the latest. Those poultry-keepers who require only a small number of young stock of the Leghorn or light breeds will find that hatching at the end of September gives very satisfactory results. Heavy breeds, however, do better if hatched out in August. Where a large number of Leghorn pullets are required, and it is not possible to get them all hatched during September, it is much better to get them hatched during August and September than during September and October. The aim should be to hatch out the chickens neither too early nor too late, but it is better to have them a little too early than too late. There is always a risk of the August-hatched birds going into a moult during the late summer or early autumn, but late-hatched stock never make the same development; they generally lay small eggs, and these during the cheap season, thus returning very little, if any, profit over the cost of their feed.

The most popular system of breeding is to mate good selected second-season hens with well-developed cockerels which have been bred from proved parents.

Though some cock birds, even in their third and fourth years, have been known to have wonderful fertility, cock birds, as a rule, cannot be depended upon, especially early in the season, to give a high percentage of fertile eggs. Where, however, an exceptionally vigorous cock bird that has produced good stock is to be found he is a valuable asset to any plant, and should be mated specially to a few selected hens. Further, the cockerels produced from such a mating should be marked and used to head next season's breeding-pen.

If the breeding-stock are in good breeding-condition the eggs should prove fertile from five to seven days after the birds have been mated, and

usually remain fertile from seven to nine days after the male has been removed from the pen. The writer does not know of any way of controlling the sex or of telling which eggs will produce cockerels or which will produce pullets. No doubt some hens lay eggs which produce more cockerels than pullets, or *vice versa*. At times if a very vigorous cockerel is mated with a few hens early in the season more cockerels may be the result, but, taking the season right through, one can generally depend upon equal numbers of each sex from most flocks.

Eggs for Hatching.

Eggs intended for incubation, whether they are to be hatched in the natural way or placed in incubators, should be selected with great care. The aim should be to rear pullets that produce eggs of a good, uniform shape, size, colour, and texture of shell, and the only way to bring this satisfactory result about is to set only eggs of a good uniform shape, size, and colour. Those with thin, porous shells should not be used, as they seldom hatch and are easily broken. It is often an indication that the bird was not in a desired physical condition when such eggs were produced and that there is a weakness which is likely to be passed on to her progeny.

Rough-shelled eggs or those with ridges are generally unsuitable—the latter are often a sign that the hen which laid them is in an over-fat condition.

While it is true that very large eggs do not hatch well, it is not to be inferred that small eggs should be used for hatching purposes, for usually the small egg produces a small bird, which in turn lays undersized eggs. No eggs under 2 oz. in weight should be set. It is well to pay attention to the colour of the shell and only set eggs with that colour of shell you desire your birds to lay. For example, Leghorns (if purebred) should lay eggs with white shells, but sometimes individual birds in a flock lay eggs with shells of various shades of colour, varying from a cream to a light brown. On the other hand, eggs of the heavier breeds, such as Orpingtons, should be a dark-brown colour, although at times eggs with a more or less white or pale shell may be produced. Most of these defects can be corrected and birds bred that produce a good uniform class of egg if careful selection is made when saving eggs for incubation purposes, but this selection must continue year after year, for great improvement cannot be effected in a single year.

Eggs should be set as fresh as possible, for those that are over ten days old seldom give satisfactory results. When holding them for incubating-purposes they should be kept where the temperature does not fluctuate too much. A temperature of between 50° and 60° F. will be found most suitable, and if the eggs are held for any length of time it is advisable to change their position each day in order to prevent the yolk settling down to the side.

Period of Incubation.

Eggs from different classes of feathered stock take different periods to hatch out, as will be seen by the following: hen-eggs, twenty-one days; ordinary duck-eggs, twenty-eight days; Muscovy duck-eggs, thirty-five days; turkey eggs, thirty-five days; goose-eggs, twenty-eight to thirty days; guinea-fowl eggs, about twenty-six days; and pheasant-eggs, twenty-four days.

Artificial Incubation.

There is little doubt that the incubator is not yet made that is the best when worked in the same manner in all climates. In other words, owing to the many different classes of machines in use, the different localities in which they are operated, and the different classes of eggs used for incubation purposes, it is impossible, or at least very unwise, to attempt to lay down a set of hard-and-fast rules to be followed in order to get the best results

under all conditions. The results from artificial incubation depend largely on the fertility and vitality of the eggs, efficiency of the incubator, handling and working of the machine, and other circumstances. In the first place, the egg must be suitable, for if the embryo springs from a weak germ it will not live long. On the other hand, if the germ is strong and the egg lacks vitality the embryo cannot continue to grow. It is quite possible for eggs to be 90 per cent. fertile yet so lacking in vitality that very few hatch, or, again, the egg may be all that is desired, but if improperly incubated it is impossible to produce a good, strong chick. In order to get eggs suitable for incubation the breeding-birds must be selected carefully, fed and managed correctly, and the eggs set as fresh as possible.

When selecting an incubator it is well to choose, if possible, a make that has been known to serve well in the locality. It is very seldom an economy to purchase a cheap or second-hand machine of unknown quality. Many cases of heavy losses and much disappointment are caused through poultry-keepers starting off with poor, second-hand machines. It is not the cost of the incubator that counts so much, but the cost of the eggs that are placed therein and the results obtained. The handling or working of the machine is an important factor, and in this connection it always is wise to follow the maker's instructions to the letter, and then if results do not come up to expectations it is advisable to consult a poultry-keeper in your own district who is working a similar make of machine. He usually is pleased to advise, and very often some slight alteration in the ventilation or the supply of moisture makes all the difference. The machine should be operated in a well-ventilated room, free from mustiness or kerosene fumes, &c., and not subject to much variation of temperature. Lamps when burning use a large amount of oxygen, and as the developing embryo also requires oxygen it is well to allow plenty of fresh air in the incubator-room, but to avoid draughts, especially near the lamps. A little extra ventilation about 3 in. or 4 in. from the floor in some incubator-houses helps considerably towards better results. If, the first time one enters the incubator-room in the morning, a strong smell of kerosene-fumes is noticed, it is well to arrange for a little more ventilation in order to keep the atmosphere fresh and sweet.

The amount of ventilation necessary depends on the class and number of machines being operated and on the size of the room. For instance, a lean-to room 15 ft. deep by 12 ft. wide, in which one 500-egg machine was operated, gave much better results when four 9 in. by 4 in. ventilators were placed about 3 in. above the floor-level, and four of a similar size were made at the ceiling-level.

Further notes regarding artificial incubation will appear next month.

—C. J. C. Cussen, *Chief Poultry Instructor, Wellington.*

THE APIARY.

Starting Beekeeping : Hints for Beginners.

THE spring is the best season of the year for starting beekeeping, especially for the beginner who is unacquainted with the practical care of bees. The time is therefore at hand when arrangements should be made for the purchase of bees and equipment. If the bees are obtainable locally the prospective beekeepers can make arrangements for the purchase of established colonies or can wait until swarming-time, when swarms are available. Perhaps the most satisfactory way is to purchase some established colonies from a neighbouring beekeeper and move them home before too much brood is present in the hives. No harm comes to bees moved in the colder months, the same provision for screening not being so essential as when moved

during the summer months. Screening the hives top and bottom is not necessary if the bees are moved only a short distance, and if the beekeeper takes the precaution of tacking a piece of wire gauze across the front entrance this prevents suffocation and makes for safe handling in transit.

The beginner is well advised to procure only strong, healthy colonies from a reliable beekeeper who can furnish a guarantee that the bees are healthy. Upon this depends much of his future success. The keystone to this condition is the permit issued by an Apiary Inspector under the Apiaries Act. The first question to be asked by the beginner of the seller is, "Have you the necessary permit to sell?" If this is forthcoming, the purchaser may rest assured that he has a reasonable chance of getting clean bees, apart from any of the other conditions which go to make a good hive. Although the purchase of first-class colonies is probably the most expensive way to commence beekeeping it has the advantage that such colonies are more easily kept in order than colonies which have been neglected and which require to have corrected the faults of the previous owner who has not learned to make his beekeeping profitable.

Since it cannot be expected that the beginner should know what constitutes a good colony, he should deal only with a beekeeper of some standing. With bees everything depends upon starting right. The possession of a colony in prime working-condition gives the beekeeper a standard with which to compare other colonies and enables him to avoid costly mistakes in their management. If the cost of starting a small apiary has to be considered, the beginner will find it an advantage to arrange for the purchase of as many first swarms as are wanted. These may be obtained in boxes and subsequently transferred to frame hives. Only early and prime swarms should be stipulated for, otherwise they will not build up in time for a crop.

The hives when placed in their permanent position should be sheltered and face the north. Protection from cold winds is important, but the hives should not be placed under trees, as this has a tendency to make the bees vicious. The hives should be set on four bricks, as this allows for a free circulation of air under the bottom-boards, which rot if placed directly on the ground. The hives require to be level crosswise and have a slight cant lengthwise. This prevents driving rains from lodging within the hives: such lodging is likely to render the combs mouldy. A watertight roof and sound bottom-board are just as essential to the welfare of bees as are good floors and roofs in human dwellings.

A certain amount of working-equipment is necessary. However, if provision is made for a smoker, bee-veil, hive-tool, and a pair of gloves, such other articles can be added as they are needed. Until such time as the beginner has become used to the stings he will find it an advantage to wear gloves, although he should accustom himself to do without them. In the course of time gloves become impregnated with poison, and this will irritate one's flesh on hot days; moreover, it is resented by the bees. There is much difference in the temper of bees: blacks are much more troublesome to handle than Italians, but with a little care in carrying out hive-manipulations and the free use of smoke most colonies can be handled with very few stings.

At all times when handling bees the beginner should be prepared to complete the work and not allow himself to be driven from the hives. By the "free use of smoke" it is not meant that the bees should receive an overdose, as this may demoralize them and render them liable to attack from other colonies. Moreover, it does not bring them under control, but tends to aggravate them. It has the further disadvantage that as the bees are driven from the combs they form in clusters on the bottoms of the frames and the sides of the hives, making it well-nigh impossible to locate the queen and to carry out other essential work with any degree of success.

Suitable fuel for the smoker is dry, clean sacking, no other material being as good. Avoid oily waste and cotton materials, as the smoke from these

articles makes the bees vicious. When starting to manipulate a hive puff a little more smoke in at the entrance, and having removed the roof, puff a little more smoke on the frames as the mat is peeled off. This operation being complete, the frame nearest to the operator can be taken out, allowing of the prizing-apart of the remainder of the frames preparatory to making a complete examination of the whole. When handling bees all operations are best carried out in a gentle manner, avoiding at all times quick movements and clumsy manipulations which may crush them. It must be remembered that nothing irritates bees more than the odour of the poison which fills the air when bees are crushed.

—*E. A. Earp, Senior Apiary Instructor, Wellington.*

HORTICULTURE.

Effective and Economical Use of Fertilizers.

INTENSIVE production of crops of fruit, vegetables, and flowers require considerable supplies of fertilizers, and the measure of success obtained depends very largely on the consideration given to their use. The demand for definite information on the subject is inclined to standardize the practice, but this has very decided limitation. Some growers of a generous disposition apply very heavy dressings, regarding it as a sound policy to keep the ground in high condition. This policy is often wasteful and sometimes injurious to the crops.

Manuring is a subject in which there is no finality and constantly requires the most careful consideration of the cultivator if the best results are to be obtained. The chief factors to be considered are the requirements of the crop about to be planted, the condition of the land at the moment, and the weather. Applications of fertilizers after the crop is established require special care. The crop may be soft and rank owing to weather conditions experienced and require hardening by an application of potash, or, if flowers and fruit or seed are required, an application of phosphates to encourage that development. It is then advisable to apply too little rather than too much, as it is better to repeat the application than have to deal with the effects of an over-dose.

The usual requirements of crops in order of importance may be stated as follows,—

(1) Turnips, carrots, beetroot, parsnips, radishes, peas, beans, melons, marrows, pumpkins, cucumbers, tomatoes: Phosphates, potash, and nitrogen.

(2) Potatoes, onions, leeks, artichokes, shallots: Potash, phosphates, and nitrogen. This does not mean that more potash than phosphates should be applied, but a maximum application of potash, about 2 cwt., and an amount of phosphates less than the maximum, which is about 10 cwt., per acre.

(3) Cabbage, spinach, celery, asparagus, cauliflower, rhubarb: Nitrogen, phosphates, and potash.

Onions and leeks are benefited by a greater amount of nitrogen than others with which they are bracketed; and asparagus, also, on the land on which it is usually grown, with more potash.

To supply these requirements economically and effectively in the form of artificial fertilizers it is necessary carefully to form an estimate of what plant-foods are already present in the land, the estimate being chiefly based on the quality of the land, the behaviour of recent crops, and consideration of residue of previous applications. Land of good quality recently broken in from pasture should produce any of the above-mentioned crops satisfactorily if a suitable dressing of only phosphates is applied. Heavy land is usually well supplied with potash and is very retentive of any application that may be made; a good dressing of farm manure will probably supply

all the requirements of crops listed in class (3), with the exception of phosphates; after which it should carry any of the crops listed in classes (1) and (2) with a similar dressing.

Usually the latter crops are grown on a medium well-drained loam for early cropping—land which is less retentive and assimilates humus with considerable rapidity. Like the light soils, it is more or less “hungry” but “early,” and it is here that the effective use of fertilizers is a fine art. Such land must be constantly supplied with humus and fertilizers applied “little and often.” With a good water-supply such land may be very productive. For annual crops sown with rows fairly close and requiring a moderate dressing the fertilizers may be broadcasted and worked in during the preparation of the land; but for crops such as outdoor tomatoes that are planted with a considerable distance between rows and require a fairly heavy dressing, the first application of fertilizers may be drilled along the line of planting; and, after planting and establishment, further dressing may be made between the rows as required and cultivated in. Where heavy dressings of fertilizers are applied, difficulties are frequently met when using nitrogen in the form of sulphate of ammonia and nitrate of soda: the tilth of the soil may be injured with serious consequence where fine seeds are sown and humus is scarce. This is particularly bad where nitrate of soda is constantly used on heavy land. The fertilizer is alkaline and the tilth is destroyed by the carbonate of soda deflocculating the clay particles. An acid manure, such as superphosphate or sulphate of ammonia, will improve the condition. Where soil deteriorates through the use of sulphate of ammonia, as it may do on soil inclined to be acid, the remedy is to apply finely ground carbonate of lime. With due caution along these lines nitrogenous fertilizers may be used with best results. The nitrate of soda being immediately available to the plants is of special value in the spring, when the temperatures are too low for the active production of nitrates by natural bacterial processes in the soil. By carefully studying his land and its reactions to fertilizers and crop one should gradually build up an experience which will enable the land to be kept in good heart and satisfactory crops to be obtained at an economical cost.

Vegetable Crops.

When the soil is dry and friable the opportunity should be taken promptly to prepare the ground for sowing and planting. In fine weather it is advisable to hoe growing crops to destroy weeds and to apply a light dressing of nitrate of soda to accelerate the growth of spring cabbage, lettuce, and other crops of the kind. It is unsafe, in most districts, to leave after the end of August parsnips and other root-crops which have been allowed to remain in the ground over winter. It is well to lift them when the ground is dry and store where the conditions are cool and humid.

Early crops, and hardy crops requiring a long growing season, should be planted so soon as land and temperatures permit. In fine weather, after the land has been thoroughly prepared, plant autumn-sown onions, shallots, rhubarb, early potatoes, artichokes, and asparagus. And sow parsnips, short-horn carrots, globe beet, turnips, radishes, broad beans, early peas, lettuce, spinach, parsley, cabbage, and cauliflower; also asparagus where roots are required for planting out twelve months hence.

To obtain good crops, good land and culture alone are not sufficient. It is important that the seeds should be sound and of good strain and variety. The successful grower always is on the look-out to obtain the best in this respect. Caution is specially necessary when selecting seed potatoes and asparagus. The Government system of seed certification is of great assistance in obtaining satisfaction as regards the former. Growers of early potatoes in warm localities should obtain fresh stocks of certified seed annually or at the longest every two or three years. In many instances the best asparagus-seed will be obtained by marking the

best plants in a good crop in the locality and allowing the plants to ripen the seed in advance of the rest of the bed. As asparagus-seed is slow in germinating it may be soaked in warm water for twenty-four hours and dried off with a little lime, which will help to regulate the planting. A few radish-seed added will germinate quickly and indicate the rows so that weed-control may not be delayed.

Half-hardy crops for planting out early in the month of November should be started on a hot-bed towards the end of August. They include tomatoes, egg-plants, peppers, melons, and cucumbers. Self-blanching celery may be included in this sowing. When established after pricking out it is advisable to ventilate freely in fine weather to produce sturdy plants. The heat in a hot-bed is obtained by fermenting fresh stable manure, which may be supplemented by leaves of deciduous trees, where obtainable. To produce a uniform state of fermentation the material is stacked in a compact heap, and, when fermentation is established actively, turned, mixed, and restacked, any dry portions being moistened from a watering-can in the process. It will probably require to be turned two or three times in this way before it is in an active state of fermentation throughout the whole mass; but time and care in its preparation is amply rewarded by the superior results obtained.

Where tomato crops under glass are to be planted out reference may be made to suggestions printed in the July copy of the *Journal*. Where this operation has already been carried out the chief consideration needs to be given to the matter of ventilation and of maintaining a satisfactory temperature at night. The plants must be kept growing steadily. A close atmosphere and soft rapid growth ultimately lead to disappointment; on the other hand, over-ventilation, especially when a cold wind is blowing, seriously checks the crop. Close attention during the changeable weather experienced at this season is necessary to maintain good growing conditions under glass at all times. Generally early ventilation in the morning on fine days, and closing down the ventilators about the middle of the afternoon, so as to retain a desirable amount of sun heat, are the main features of the programme. A sharp look-out should be kept for green aphid, at the first sign of which it is advisable to fumigate with nicotine sulphate 1 fluid ounce to 1,000 cubic feet of space. The liquid should be vaporized by placing it in open tins over spirit-lamps. To disseminate the fumes as quickly as possible vaporizing should be done in a number of places about the floor of the house. An evening without wind and the house tightly closed are the most desirable conditions.

For the tomato crop outside, in addition to raising good plants, consideration must now be given to the preparation of the land. In many instances the land may be carrying spring cabbage or salad crops, but careful consideration should be given and arrangements made to take it in hand as soon as it is available so that the preparation may be completed in good time for planting the early crop.

Small Fruits.

New plantations of hardy fruits should be made as soon as possible, and the plants carefully pruned as described in the June number of this *Journal*. The more tender crops, such as passion-vines and Cape gooseberries, may be left for planting later when temperatures are warmer.

Unless it has already been done, established crops should be given a dressing of fertilizers, principally phosphates and potash, followed by a dressing of nitrogenous manure as they come into flower.

To control leaf-spot and other fungous diseases to which these crops are susceptible a thorough application of Bordeaux 3-4-40 should be made shortly before growth commences. As an alternative, $\frac{1}{2}$ pint of lime-sulphur diluted with four gallons of water may be used. This latter spray is also

a good remedy for rose-scale, which is frequently found attacking raspberry plantations. The application should be repeated at intervals of two or three weeks, as may be necessary.

The Homestead Garden.

As the planting season for hardwood plants closes about the end of the month of September advantage should be taken of intervals when the weather is fine and the soil dry to complete work of this kind. Hardy herbaceous borders may also be planted, and the sooner new lawns are completed, especially in the drier districts, the better will be the chance of rapid and satisfactory establishment. Gravelling walks and returfing broken verges will also add much to the appearance and comfort of the homestead garden.

During the month of August sweet peas and other hardy annuals may be sown outside, and towards the end of the month half-hardy annuals in boxes on a hot-bed for planting out when spring frosts have finished.

Rose-pruning should now be completed. Varieties of most kinds flower on the new wood, which is produced best on good wood of the previous season. For this reason weak and old wood may be discarded, except such as may be required for furnishing the plant. If the plants are afterwards sprayed with lime sulphur it will do much towards the control of fungous disease and the scale blight to which roses are susceptible.

—W. C. Hyde, *Horticulturist*, Wellington.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from the 13th June, 1935, to 27th June, 1935, include the following of agricultural interest:—

No. 72819: Plough; J. A. Thomson. No. 73606: Deburring skins; O. Stone and T. S. Bull. No. 73827: Butter-churning (*Cognate with No. 72919 below*). No. 72086: Cheese-crate; A. St. C. Hill. No. 72919: Butter-churning; Vacu Churns, Ltd. No. 73741: Active humus; N. V. Octrooien Maatschappij "Activit." No. 73814: Fruit-crate; G. Strachan. No. 73828: Animal-trap; W. L. Ure. No. 73831: Nutrient material; British Arkady Co., Ltd. No. 73844: Meat-roll; H. Vickers. No. 73856: Cream preparation; S. H. Hartmann. No. 73867: Seed-planting; A. McWatters, jun. No. 73869: Garden tool; The Interchangeable Garden Tool Co., Ltd. No. 73877: Meat-protein preparation; Chappel Bros.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Commissioner of Patents, Wellington, price 1s., prepaid.

In pursuance of section 3 of the Poultry-runs Registration Act, 1933, Mr. Walter Horrobin has been appointed a Government representative on the New Zealand Poultry Board.

The Role of Soil Analysis.—It has become possible to take up once more the important question of soil analysis. Nothing in agricultural science has had a more chequered career. Hailed at the outset as a great scientific triumph, it had to be abandoned because its results were so often useless to the farmer. It is now recognized that two distinct problems are involved: Soil analysis for advice in regard to manuring, and soil analysis for the characterization of soils for purposes of soil surveys. Two groups of methods are therefore needed, and these are being worked out in the Chemical and Physical Departments.—*Rothamsted Report for 1933.*

CERTIFICATION OF SEED POTATOES.

CROPS PASSED TUBER INSPECTION TO 30TH JUNE, 1935.

APPENDED is a list of growers whose crops have been subject to and have passed the tuber inspection in connection with the system of Government certification of seed potatoes conducted by the Department of Agriculture. The list comprises those crops passed up to 30th June. Further lists will be published in later issues.

In the May *Journal* was published a list of growers who had received provisional certificates. The acreage, percentage of foreign varieties present, and the classification and group number representing the relative merits of lines were given in that list, to which intending purchasers should refer.

AUCKLANDER SHORT TOP.

Mother Seed—

Adams Bros., Sheffield (Line A).
Adams Bros., Sheffield (Line B).
Hegan, J., and Son, Southbrook (Line B).
Kenyon, F., Mina, North Canterbury (Line B).
Oakley, J. T., Eiffelton, R.M.D. (Line A).
Oakley, J. T., Eiffelton, R.M.D. (Line B).
Oakley, W., Halkett, R.M.D. (Line A).
Oakley, W., Halkett, R.M.D. (Line B).
Overton, H. M., Lakeside.
Redmond, C., Kimberley, R.M.D.
Smith, E. A., Springston, R.M.D. (Line A).
Westaway, R. J., Courtenay, R.M.D.
Wright, L. T., Annat.

Commercial Seed—

Ballantyne's Estate, Fairview, Timaru.
Gray, J. L., St. Andrew's (Line C).
Kelleher, T., Pleasant Point, South Canterbury (Line B).
Rich, A. J., Kaiapoi, R.M.D.
Ross, A., Washdyke, Timaru (Line A).
Ross, A., Washdyke, Timaru (Line B).
Steven, G. H., Rosewill, Timaru.
Weeber, H., Englefield Road, Belfast (Line C).

DAKOTA.

Mother Seed—

Ryan, P. F., Weedon's, R.M.D.

Commercial Seed—

Steven, G. H., Rosewill, Timaru.

ARRAN CHIEF.

Mother Seed—

Robinson, R. G., Ltd., Box 4, Papanui, Christchurch (Line A).
Wright, L. T., Annat.

Commercial Seed—

Bruce, J. A., Otahuti, R.M.D.
Oliver, J. O. J., Factory Road, Temuka.
Topham, J. W., Arowhenua, Temuka (Line C).

ARRAN BANNER.

Mother Seed—

Burgess, D., West Plains, Invercargill.
Knowler, H., Te Waewae.
Milburn, M., Wright's Bush, R.M.D., Invercargill.
Wright, L. T., Annat.

Commercial Seed—

Barnes, W., and Son, 199 Highsted Road, Styx.
Craig, G. H., Mosgiel (Line A).
Craig, G. H., Mosgiel (Line B).
Oakley, W., Halkett, R.M.D.

KING EDWARD.

Mother Seed—

Burgess, D., West Plains, Invercargill.
Kokay, S., Tuatapere.
Milburn, M., Wright's Bush, R.M.D., Invercargill.
Miller, R., East Taieri.

Commercial Seed—

Bruce, J. A., Otahuti, R.M.D.
Craig, G. H., Factory Road, Mosgiel.
Graham, J. W., Factory Road, Mosgiel (Line A).
Graham, J. W., Factory Road, Mosgiel (Line B).
Graham, J. W., Factory Road, Mosgiel (Line C).
Penn, T. A., 154 Innes Road, Christchurch.

EARLY ROSE.

Mother Seed—

Shellock, W., Te Pirita, R.M.D., Rakaia.
Weaver, J., care of A. Weaver, Te Pirita, R.M.D., Rakaia.

EPICURE.

Mother Seed—

Shellock, W., Te Pirita, R.M.D., Rakaia.

Commercial Seed—

Campbell, D., King Street, Rangiora (Line B).

JERSEY BENNES.

Mother Seed—

Burgess, D., West Plains, Invercargill.
 Milburn, M., Wright's Bush, R.M.D.,
 Invercargill.

MAJESTIC.

Mother Seed—

Oakley, J. T., Eiffelton, R.M.D.

EARLY REGENT BOLTER.

Mother Seed—

Oakley, W., Halkett, R.M.D.

Commercial Seed—

Oakley, J. T., Eiffelton, R.M.D.

IRON DUKE.

Commercial Seed—

Penn, T. A., 154 Innes Road, Christchurch.

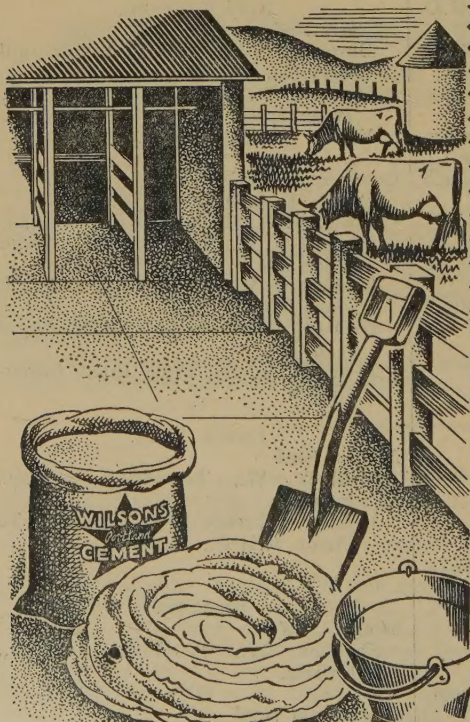
SIR J. G. WILSON.

Mother Seed—

Robinson, R. G., Ltd., Box 4, Papanui,
 Christchurch.

—Fields Division.

The yield of citrus fruits in the Dominion is gradually increasing, and in this connection it may be noted that the Poorman orange is increasing in popularity and coming into use as a good substitute for imported grape-fruit. The production of lemons is excellent as regards quantity, but the marketable quality of many of these home-grown lemons is greatly depreciated through failure to subject them to a proper grading and curing process. If all our lemons were properly graded and cured there would be little need for importations of this fruit.—*Report, Director-General of Agriculture.*



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WEATHER RECORDS: JUNE, 1935.

Dominion Meteorological Office.

NOTES FOR JUNE.

JUNE was remarkable for several severe storms, which were responsible for prolonged and strong winds between westerly and south-westerly and for frequent wet days. Owing, however, to lack of extreme temperatures, in most districts there was some growth in pasture, and stock generally continued in good condition. This was especially the case in much of the North Island, where an absence of hard frosts and periods of mild temperature induced an abnormal growth of grass for the time of the year.

Rainfall.—The aggregate rainfall was below the average in a small area about Cook Strait and parts of the western districts of the South Island, while the remainder of the Dominion recorded above normal.

Temperatures.—Temperatures were above the average over most of the North Island, the difference being greatest in the Taranaki and Auckland districts. In the South Island they were below, except in the extreme north and parts of Central Otago.

Sunshine.—As might be expected from the large number of wet days experienced, sunshine was nearly everywhere below the mean, the only districts where it was above being Marlborough and Otago.

Storm Systems.—The month began with fine weather, which lasted until the 4th, while an anticyclone was moving across New Zealand.

On the 5th and 6th a cyclone moved from the north, passing off East Cape during the night of the latter date. Heavy rain was associated with this disturbance between Hawke's Bay and East Cape and some flooding occurred. Dull, misty conditions prevailed generally, but rainfall was only light and scattered in the South Island. There was a fairly general improvement in the weather on the 7th, but from the 8th to the 12th a series of deep westerly depressions crossed the Tasman Sea and New Zealand. Consequently, strong north-west to south-west winds and boisterous conditions were experienced in most districts. During the night of the 9th, while a secondary low centre was crossing the South Island, much of the South Island and some of the high country in the North Island experienced a fall of snow. There were other but lighter falls of snow on the 11th and 12th, and on the latter date a bitterly cold south-westerly wind swept over the Dominion accompanied by hail in places. During the evening of the 12th, however, the weather rapidly cleared and some severe frosts were recorded in the night, Christchurch having one of 13·8 degrees. The last portion of this series of depressions had, by then, passed eastwards, and several days' fair to fine weather followed.

By the evening of the 16th a fresh depression had moved on to the Dominion, and until it had passed away eastwards on the 20th cloudy and squally weather prevailed over most of the country with intermittent and, in places, heavy rain. Otago experienced particularly heavy southerly rains on the 18th, and there was considerable flooding in low-lying areas. By the morning of the 19th a general change to southerly winds had taken place, and cold southerlies continued throughout the 20th, with showers in most districts and hail on parts of the coast.

An anticyclone covered the Dominion on the 20th, and the weather was brilliantly fine almost generally. The former, however, moved rapidly eastwards and was followed by a further series of deep depressions, which continued to cross the country until the close of the month. Consequently, strong westerly to south-westerly winds prevailed. In eastern areas during this period precipitation was mainly light and scattered, but districts with a westerly aspect and the central areas of the North Island experienced persistent rain and some of their heaviest falls.

RAINFALL FOR JUNE, 1935, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average June Rainfall.	Total Rainfall to Date.	Average Rainfall to Date.
<i>North Island.</i>						
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitia	4.60	25	0.42	6.59	32.99	28.16
Russell	8.08	22	2.50	6.49	53.62	27.33
Whangarei	10.76	25	2.00	6.54	43.12	31.60
Auckland	7.02	27	0.87	5.44	32.57	24.28
Hamilton	7.21	24	1.15	5.11	24.20	23.90
Rotorua	10.16	20	1.90	5.25	38.60	26.87
Kawhia*	..	..	..	5.72	..	25.54
New Plymouth	7.82	23	0.95	5.95	41.91	28.54
Riversdale, Inglewood ..	13.45	24	1.70	10.27	65.68	48.65
Whangamomona	10.54	18	1.45	7.89	49.04	35.70
Hawera	7.92	23	1.30	4.41	33.91	21.39
Tairua	7.71	25	1.51	6.97	40.49	33.56
Tauranga	8.25	23	1.25	5.35	36.16	26.88
Maraehako Station, Opo-tiki	9.87	17	2.98	5.66	45.90	27.79
Gisborne	6.91	15	1.95	4.90	24.97	24.91
Taupo	7.13	17	1.29	4.56	29.60	21.36
Napier	7.71	18	3.66	2.92	27.12	16.08
Hastings	5.49	16	2.75	3.07	21.50	16.63
Whakarara Station	8.11	19	3.22	..	32.85	..
Taihape	4.35	21	0.93	3.38	20.33	17.81
Masterton	4.11	20	0.65	3.59	18.26	18.77
Patea	7.21	18	1.47	4.24	31.55	21.40
Wanganui	4.37	18	0.77	3.37	24.01	17.70
Foxton	4.59	15	0.70	3.39	19.11	15.27
Wellington	2.80	16	0.60	4.31	17.15	20.89
<i>South Island.</i>						
Westport	9.24	22	1.23	8.85	49.95	46.50
Greymouth	8.55	19	1.48	8.80	55.95	49.56
Hokitika	8.74	20	2.69	9.22	68.26	55.09
Ross	8.69	17	1.68	8.73	66.13	62.77
Arthur's Pass	3.71	7	1.10	10.53	77.32	75.94
Okuru, South Westland	4.82	7	1.25	10.72	64.56	72.04
Collingwood	10.89	20	2.14	10.30	53.25	45.08
Nelson	3.51	17	1.32	3.51	24.82	18.32
Spring Creek, Blenheim	2.56	14	0.78	2.94	15.48	14.47
Seddon	0.92	8	0.26	2.09	9.51	12.32
Hanmer Springs	5.03	15	1.69	3.39	20.51	21.77
Highfield, Waiau	3.28	7	1.25	2.47	13.32	16.74
Gore Bay	2.87	11	0.62	2.69	11.57	15.87
Christchurch	3.22	9	1.17	2.53	11.66	12.63
Timaru	3.27	10	1.07	1.75	12.61	11.14
Lambrook Station Fairlie	3.78	7	1.94	1.86	13.85	11.98
Benmore Station, Clearburn	0.85	12	0.27	1.81	13.28	12.80
Oamaru	2.20	9	1.61	1.98	11.72	10.98
Queenstown	2.69	11	0.64	2.22	19.92	15.35
Clyde	2.47	6	1.15	0.92	10.69	7.76
Dunedin	5.89	17	3.72	3.14	22.63	18.08
Wendon	4.92	15	1.52	2.59	22.52	15.48
Balclutha	5.26	11	2.14	1.99	20.52	12.71
Invercargill	7.38	23	1.00	3.64	31.18	23.31
Puysegur Point	9.44	22	1.34	6.59	47.73	42.26
Half-moon Bay	6.75	22	1.03	4.91	31.52	29.13

* Observer died.